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Pavement Testing Facility–
Phase 1
Final Report

Research and Development
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

FOREWORD

In 1986, the Federal Highway Administration established the Pavement Testing Facility (PTF) at the Turner-Fairbank Highway Research Center in McLean, Virginia. The PTF is an outdoor pavement testing laboratory consisting of the Accelerated Loading Facility (ALF) pavement testing machine and several instrumented pavement test sections. The PTF provides the capability to evaluate pavement problems of high national concern.

This report summarizes the results of the accelerated pavement performance tests conducted with the ALF during the first phase of research at the PTF (October 1986 through April 1989). This report will be of interest to both practicing and research engineers dealing with flexible pavement performance. Other completed PTF reports include:

- FHWA-RD-88-059, *Pavement Testing Facility - Design and Construction*
- FHWA-RD-88-060, *Pavement Testing Facility - Pavement Performance of the First Two Test Sections*
- FHWA-RD-89-123, *Pavement Testing Facility - Effects of Tire Pressure on Flexible Pavement Response and Performance.*

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Byron N. Lord

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Operations Research and Development

NOTICE

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16. Abstract

The Pavement Testing Facility (PTF) is a permanent, outdoor, full-scale pavement testing laboratory located at the Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center in McLean, Virginia. The purpose of this facility is to quantify the performance of test pavements trafficked under accelerated loading. The facility consists of several instrumented test pavements and the Accelerated Loading Facility (ALF) testing machine. Formal operation of the facility began in October, 1986.

This report summarizes the work performed during the first phase of research, October 1986 to April, 1989. The report includes a discussion of the construction and instrumentation of the PTF test pavements. It describes the operation of the ALF testing machine, and the data collection procedures used at the PTF. The report also summarizes the environmental, and pavement response and performance data collected during the first phase of research. Finally, an analysis of the accelerated pavement testing data was conducted to assess the strengths and weaknesses of accelerated testing with the ALF machine.

17. Key Words

Accelerated Loading Facility
Pavement Testing
Pavement Performance
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	l
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 l shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	l
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
psi	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	ac
ha	hectares	2.47	acres	mi^2
km^2	square kilometers	0.386	square miles	
		VOLUME		
ml	milliliters	0.034	fluid ounces	fl oz
l	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg	megagrams	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	psi

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised August 1992)

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CHAPTER 1. INTRODUCTION

BACKGROUND

The Pavement Testing Facility (PTF) is a permanent, outdoor, full-scale pavement testing laboratory located at the Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center in McLean, Virginia. The purpose of this facility is to quantify the performance of test pavements trafficked under accelerated loading. The facility consists of several instrumented test pavements and the Accelerated Loading Facility (ALF) testing machine. Formal operation of the facility began in October 1986.

PURPOSE AND SCOPE

The first phase of pavement research was conducted at the PTF from October 1986 through February 1989. During this phase, eight pavement test sections were trafficked using a range of loads and tire pressures. The objectives of the first phase of research were:

- Establish operating and data collection procedures for the PTF.
- Study pavement response and performance for a range of loads and tire pressures, with emphasis on the influence of tire pressure.
- Assess the rationality of pavement response and performance data obtained from accelerated testing methods.

This report summarizes the work performed during the first phase of research. The report includes a discussion of the construction and instrumentation of the PTF test pavements. It describes the operation of the ALF testing machine, and the data collection procedures used at the PTF. The report also summarizes the environmental, and pavement response and performance data collected during the first phase of research. Finally, an analysis of the accelerated pavement testing data was conducted to assess the strengths and weaknesses of accelerated testing with the ALF machine.

CHAPTER 2. PAVEMENT TESTING FACILITY

TEST PAVEMENT CONSTRUCTION

For the first phase of research, the PFT included two, 3.96-m (13-ft) wide, 61-m (200-ft) long asphalt concrete test lanes, designated Lane 1 and Lane 2 as shown in figure 1. Each test lane was divided into four test sections, designated section 1 through section 4, for a total of eight test sections. The two lanes were separated by a 4.12-m (13.5-ft) wide median, which provided a location for maintaining and repairing the ALF testing machine. To facilitate surface drainage, the site had a longitudinal slope of 0.5 percent, and each lane had a cross slope of 1.5 percent.

Design cross sections for the two lanes are presented in figure 2. Each lane consisted of asphalt concrete wearing and binder courses, and a dense graded crushed aggregate base course over a uniformly prepared subgrade. The two lanes differed in total pavement thickness and thickness of the individual layers, and were designed to sustain substantially different traffic levels. Lane 1 was a relatively weak pavement structure with a design structural number of 2.90. Lane 2, with a design structural number of 4.76, was a much stronger structural section. The pavements were constructed by a local highway contractor in the summer of 1986. The materials and construction procedures employed were accordance with the Virginia Department of Highways and Transportation specifications.(1)

PAVEMENT THICKNESSES

A construction problem identified during the first phase of research was inadequate grade control during grading of the subgrade and crushed aggregate base.(2) Table 1 presents average layer thicknesses measured by differential leveling during construction. These thicknesses were measured along the centerline of the proposed ALF wheelpath for each test section. Table 1 shows a relatively large variation in layer thicknesses particularly for the crushed aggregate base course. The average thicknesses presented in table 1 were used in all analyses of pavement response and performance for the phase 1 test sections.

MATERIAL PROPERTIES

Various laboratory and in-situ tests were performed to characterize the pavement materials. Tests were conducted at the time of construction and after failure of each test section. Additionally, samples of the materials were tested by other researchers in conjunction with various projects. The following sections summarize the results of these tests.

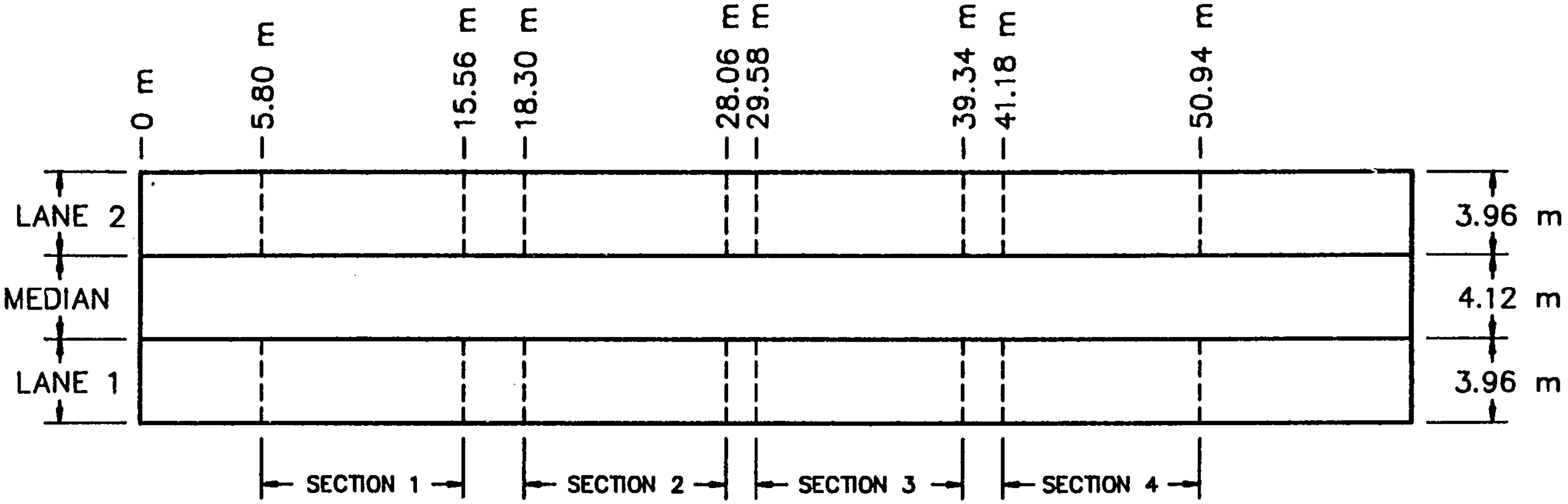


Figure 1. Pavement Testing Facility site plan.

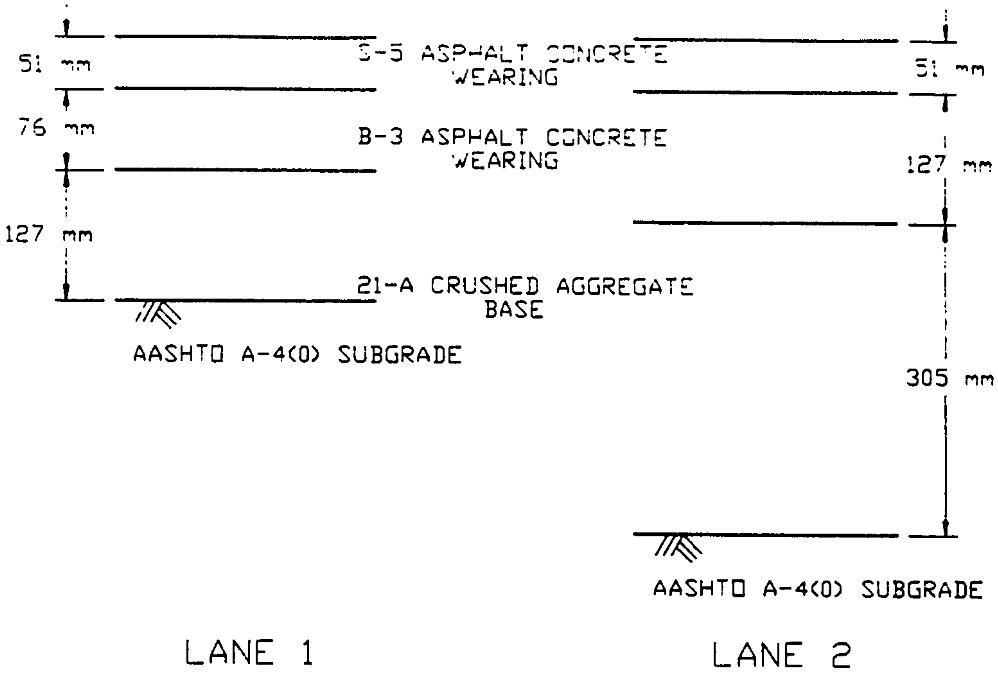


Figure 2. Design pavement cross sections.

Table 1. Average layer thicknesses.

		Thickness, mm (in)	
Lane	**Section**	**Aggregate Base**	**Asphalt Concrete**
1	1	114 (4.5)	127 (5.0)
	2	122 (4.8)	127 (5.0)
	3	140 (5.5)	122 (4.8)
	4	165 (6.5)	107 (4.2)
2	1	287 (11.3)	178 (7.0)
	2	285 (11.2)	173 (6.8)
	3	300 (11.8)	185 (7.3)
	4	235 (12.8)	178 (7.0)

Subgrade

The subgrade soil was a nonplastic, silty, fine sand, with an American Association of State Highway and Transportation Officials (AASHTO) classification A-4 (0). Table 2 presents the results of gradation, specific gravity, Atterberg limits, moisture-density, and soaked CBR tests performed on samples of the subgrade soil. In addition to these tests, a limited number of resilient modulus tests, and rapid triaxial shear strength tests were performed by other researchers.(2,3) Table 3 summarizes the resilient modulus models which define the non-linear characteristics of the subgrade soil. These models show the soil exhibited a stress hardening behavior characteristic of granular materials. The exponent in these models indicates the degree of stress sensitivity of the soil. Note, the exponents from the two references are the same in-spite of the differences in density, moisture content, and gradation. The rapid shear testing was conducted at a rate of 38 mm/sec (1.5 in/sec) on samples at the reference 3 density, moisture content, and gradation. These tests indicated a cohesion of 48.3 kPa (7 psi) and an angle of internal friction of 16 degrees.

In-situ density and moisture content tests were conducted during construction and after each test section failed. A dry density of 1788 kg/m^3 (111.6 lb/ft^3) was considered representative of the subgrade soil. The average moisture content at the time of construction was 10.0 percent. Post failure tests indicated this moisture content increased to approximately 17.0 percent within the first year, and then remained relatively constant.

Crushed Aggregate Base

The base course material used in the construction of the PTF test sections was a dense graded, crushed diabase from Manassas, Virginia. Table 4 presents the results of gradation, specific gravity, and moisture-density tests performed on samples of the crushed aggregate base.

In addition to these tests, a limited number of resilient modulus tests were performed by other researchers.(2,3) Table 5 summarizes the resilient modulus models which define the non-linear characteristics of the crushed aggregate base. Like the subgrade soil, the base course exhibited a stress hardening behavior characteristic of granular materials. The model from reference 2 has a much higher exponent, indicating a greater degree of stress sensitivity. Typically, as the quality of a material increases, the exponent decreases. In other words, higher quality materials exhibit more linear behavior. Considering the exponents in the subgrade and the base course models, one would expect the crushed aggregate exponent to be less than that for the silty sand. Therefore, the model from reference 3 is considered more representative of the crushed aggregate base course behavior.

Table 2. Summary of subgrade characterization tests.

Gradation		**Percent Passing**	
	Sieve Size	**Average**	**Range**
	25 mm (1 in)	100	94-100
	14 mm (3/4 in)	99	94-100
	9.5 mm (3/8 in)	97	89-100
	4.75 mm (#4)	96	88-100
	2 mm (#10)	95	87-99
	425 μm (#40)	85	90-70
	75 μm (#200)	47	44-48
Apparant Specific Gravity	2.840		
Plasticity Index	Non-plastic		
AASHTO T-99 Moisture Density **Max. Dry Density** **Opt. Moisture**	1792 kg/m^3 (111.9 lb/ft^3) 14.9 %		
AASHTO T-180 Moisture Density **Max. Dry Density** **Opt. Moisture**	1948 kg/m^3 (121.6 lb/ft^3) 11.4 %		
California Bearing Ratio	6.7		

Table 3. Summary of subgrade soil resilient modulus models.

Reference 2 Subgrade Resilient Modulus Models[1]			
	$M_r = 4295 (\theta)^{0.52}$	σ_d = 34.5 and 55.2 kPa (5 and 8 lb/in^2)	
	$M_r = 8590 (\theta)^{0.52}$	σ_d = 13.8 kPa (2 lb/in^2)	
	Density	1730 kg/m^3 (108.0 lb/ft^3)	
	Moisture Content	10.0 %	
	Gradation	Sieve Size	Percent Passing
		25 mm (1 in)	100
		19 mm (3/4 in)	98
		9.5 mm (3/8 in)	97
		4.75 mm (#4)	94
		2 mm (#10)	92
		425 μm (#40)	79
		75 μm (#200)	45
Reference 3 Subgrade Resilient Modulus Model[1]			
	$M_r = 3688 (\theta)^{0.52}$		
	Density	1722 kg/m^3 (107.5 lb/ft^3)	
	Moisture Content	17.5 %	
	Gradation	Sieve Size	Percent Passing
		25 mm (1 in)	100
		19 mm (3/4 in)	97
		9.5 mm (3/8 in)	92
		4.75 mm (#4)	87
		2 mm (#10)	83
		425 μm (#40)	71
		75 μm(#200)	34

[1] Models yield M_r in kPa for stresses in kPa (1kPa = 0.145038 lb/in^2)

Table 4. Summary of crushed aggregate base characterization tests.

Gradation		**Percent Passing**	
	Sieve Size	**Average**	**Range**
	37.5 mm (1-1/2 in)	100	
	25 mm (1 in)	96	94-98
	19 mm (3/4 in)	88	83-93
	12.5 mm (1/2 in)	78	72-85
	9.5 mm (3/8 in)	72	66-80
	4.75 mm (#4)	61	56-70
	2.36 mm (#8)	49	44-62
	1.18 mm (#16)	38	34-44
	600 μm (#30)	29	26-34
	300 μm (#50)	22	19-26
	150 μm (#100)	16	14-20
	75 μm (#200)	12	10-15
Apparant Specific Gravity			
Coarse Fraction	2.930		
Fine Fraction	2.934		
Absorption			
Coarse Fraction	0.98 %		
Fine Fraction	1.85 %		
AASHTO T-99 Moisture Density			
Max. Dry Density	2371 kg/m^3 (148.0 lb/ft^3)		
Opt. Moisture	7.8 %		
AASHTO T-180 Moisture Density			
Max. Dry Density	2436 kg/m^3 (152.1 lb/ft^3)		
Opt. Moisture	5.8 %		

Table 5. Summary of crushed aggregate base resilient modulus models.

Reference 2 Crushed Aggregate Base Models[1]			
	M_r = 8534 $(\theta)^{0.80}$	σ_d = 82.7 and 124.1 kPa (12 and 18 lb/in^2)	
	M_r = 19568 $(\theta)^{0.80}$	σ_d = 41.4 kPa (6 lb/in^2)	
	Density	2451 kg/m^3 (153.0 lb/ft^3)	
	Moisture Content	3.2 %	
	Gradation	Sieve Size	Percent Passing
		37.5 mm (1-1/2 in)	100
		25 mm (1 in)	95
		19 mm (3/4 in)	85
		9.5 mm (3/8 in)	70
		4.75 mm (#4)	60
		2.36 mm (#8)	47
		300 μm (#50)	21
		75 μm (#200)	12
Reference 3 Crushed Aggregate Base Model[1]			
	M_r = 39050 $(\theta)^{0.23}$		
	Density	2283 kg/m^3 (142.5 lb/ft^3)	
	Moisture Content	5.5 %	
	Gradation	Sieve Size	Percent Passing
		37.5 mm (1-1/2 in)	100
		25 mm (1 in)	97
		19 mm (3/4 in)	90
		9.5 mm (3/8 in)	71
		4.75 mm (#4)	60
		2.00 mm (#10)	40
		425 μm (#40)	22
		75 μm (#200)	12

[1] Models yield M_r in kPa for stresses in kPa (1kPa = 0.145038 lb/in^2)

In-situ density and moisture content tests were conducted during construction and after each test section failed. A dry density of 2303 kg/m^3 (143.8 lb/ft^3) was considered representative of the crushed aggregate base layer. The average moisture content was 3.2 percent at the time of construction. Post failure tests indicated this moisture content increased to approximately 5.4 percent within the first year, and then remained relatively constant.

Asphalt Concrete

The PFT test sections included asphalt concrete wearing and binder courses. Both mixes were produced with the same aggregate and AC-20 asphalt cement. Table 6 presents the components and job mix formulas for the two mixtures. The wearing mix was a typical dense graded mix with a maximum aggregate size of 12.5 mm (1/2 in). The binder mix, which was also dense graded, had a maximum aggregate size of 37.5 mm (1-1/2 in). Various properties of the virgin asphalt cement and asphalt cement recovered from loose mix samples of the paving mixtures are presented in table 7. Samples of both mixtures taken from the paver during construction were subjected to a Marshall mixture analysis. Additionally, extraction tests were performed on loose mix samples obtained during construction and pavement cores obtained after each test section failed. The results of these tests are summarized in table 8. Finally, table 9 summarizes the results of air void content and indirect tension modulus tests conducted on cores removed from untrafficked areas after each test section failed.

Nondestructive Testing

During construction of the PTF test sections, nondestructive testing (NDT) was performed with a falling weight deflectometer (FWD) on the surface of each pavement layer. The purpose of this testing was to establish in-situ properties for each of the pavement layers prior to trafficking the pavement. Additionally, the results of these tests were used to identify differences between the pavement test sections. Table 10 summarizes the results of the NDT in terms of composite moduli. Appendix A presents the NDT data collected during construction. The composite moduli in table 10 were calculated from the Boussinesq deflection equation using the deflections and radial offsets measured during the NDT.

$$E=\left[\frac{pa(1-v^2)}{d(r)}\right]F \qquad (1)$$

where

E = composite modulus
p = contact pressure
a = plate radius
v = Poisson's ratio (0.35 assumed)

Table 6. Asphalt concrete job mix formulas and mixture composition.

Job Mix Formulas

Gradation		Percent Passing	
	Sieve Size	Binder	Wearing
	37.5 mm (1-1/2 in)	100	
	19 mm (3/4 in)	75-83	
	12.5 mm (1/2 in)		100
	4.75 mm (#4)	39-47	60-68
	2.36 mm (#8)	28-36	
	600 μm (#30)		23-29
	75 μm (#200)	3-5	4-6
Asphalt, %		4.2-4.8	5.3-5.9

Mixture Composition

		Proportion			
Material	**Type**	**Binder**	**Wearing**	**Specific Gravity**[1]	**Absorption %**
37.5 mm Coarse	Diabase	25[2]		2.947	0.62
19 mm Coarse	Diabase	30[2]		2.935	0.88
12.5 mm Coarse	Diabase		40[2]	2.963	1.01
2 mm Screenings	Diabase	35[2]	40[2]	2.950	2.18
Natural Sand	Quartz	10[2]	10[2]	2.669	1.37
Asphalt Cement	AC-20	4.5[3]	5.6[3]		
Antistrip	Pave Bond	0.5[4]	0.5[4]		

[1] Apparant specific gravity
[2] Percent by weight of aggregate
[3] Percent by weight of total mix
[4] Percent by weight of asphalt cement

Table 7. Asphalt cement properties.

Test and Conditions	**Result**	
Specific Gravity, 25 °C	1.024	
Flash Point, °C	312.8	
Penetration, 25 °C, 100 g, 5 s	78	
Viscosity, 135 °C, centistoke	413	
Viscosity, 60 °C, poise	2160	
Solubility, trichlorethylene, %	99.46	
Thin Film Oven, 162.8 °F, 5 hours		
Loss, %	0.21	
Penetration, 25 °C, 100 g, 5 s	48	
Viscosity, 135 °C, centistoke	600	
Viscosity, 60 °C, poise	5145	
Recovered Asphalt[1]	Binder	Wearing
Penetration, 25 °C, 100 g, 5 s	47	50
Viscosity, 135 °C, centistoke	699	675
Viscosity, 60 °C, poise	7397	5563

°C = 5/9(°F -32)

[1] Paving mixtures contained 0.5 % by weight of asphalt cement Pave Bond antistripping additive.

Table 8. Summary of Marshall mix and extraction analyses.

Marshall Mixture Analysis[1]

Property	**Binder**	**Wearing**
Asphalt Content, %	4.5	5.6
Bulk Specific Gravity	2.580	2.557
Theoretical Specific Gravity	2.650	2.606
Effective Specific Gravity	2.865	2.867
Air Void Content, %	2.6	1.9
Stability, kN (lb)	21.71 (4880)	14.81 (3330)
Flow, mm (0.01 in)	--	3.6 (14)

Extraction/Gradation Results

Gradation		**Percent Passing**			
		Binder		**Wearing**	
	Sieve Size	**Average**	**Range**	**Average**	**Range**
	37.5 mm (1-1/2 in)	100			
	25 mm (1 in)	97	91-100		
	19 mm (3/4 in)	83	72-89		
	12.5 mm (1/2 in)	58	47-67	100	
	9.5 mm (3/8 in)	50	40-59	95	92-98
	4.75 mm (#4)	43	35-52	64	58-70
	2.36 mm (#8)	36	30-42	46	41-49
	1.18 mm (#16)	28	24-33	35	32-37
	600 μm (#30)	21	18-24	25	24-27
	300 μm (#50)	13	11-15	16	14-17
	150 μm (#100)	9	7-10	11	9-12
	75 μm (#200)	6	5-8	8	8-10
Asphalt Content, %		4.7	3.5-5.3	5.6	5.1-5.9

[1] Field samples compacted 75 blows per side at 121.1 °C (250 °F)

d(r) = deflection at radial offset r
F = Boussinesq deflection factor.

r/a	F
0	0.5
1.0 - 1.2	$1.273(r/a)^{-1.683}$
1.2 - 3.0	$1.12(r/a)^{-1.12}$
> 3.0	$1.01(r/a)^{-1.01}$

For an infinite thickness of a linear material, equation 1 would result in the same calculated modulus at each radial offset. The subgrade composite moduli in table 10, however, first decrease then increase with increasing radial offset. This type of behavior is characteristic of stress softening materials whose stiffness decreases as the shear stress increases. At first, this result may appear to conflict with the laboratory tests which showed the subgrade to be a stress hardening material. A closer look at the Reference 2 models in table 3, which were developed from tests at various deviatoric stresses, shows the modulus to decrease with increasing deviatoric stress and to increase with increasing confinement. This type of behavior is not uncommon for granular materials, and a model of the form of equation 2 has been proposed to account for both of these effects.(4)

$$M_r = k1\theta^{k2}\tau_{oct}^{-k3} \qquad (2)$$

where

M_r = resilient modulus
θ = bulk stress
τ_{oct} = octahedral shear stress
k1, k2, k3 = nonlinear material coefficients from regression analysis.

Table 9. Summary of air voids and resilient modulus tests.

				Resilient Modulus, MPa					
		Air Voids, %		**5 °C**		**25 °C**		**40 °C**	
Mix	**No.**	**Avg**	**σ**	**Avg**	**σ**	**Avg**	**σ**	**Avg**	**σ**
Binder	54	3.41	1.37	15334	1944	2761	665	505	205
Wearing	43	4.74	1.10	12790	1124	2337	514	459	108

1 MPa = 145.038 lb/in^2
°C = 5/9(°F-32)

Table 10. Summary of composite moduli from construction NDT data.

			Composite Modulus, MPa					
			Radial Offset, mm					
Lane	**Sec**	**Location**	**0**	**211**	**412**	**511**	**810**	**1270**
1	1	Subgrade	55.5	34.9	47.7	58.1	86.9	--
		Base	66.0	46.1	60.7	86.9	107.2	118.1
		Surface	103.8	57.4	48.4	62.3	104.3	122.0
1	2	Subgrade	46.3	32.5	41.7	63.6	78.7	--
		Base	55.3	51.0	64.8	85.8	100.0	131.1
		Surface	113.2	62.7	53.0	66.6	105.8	136.0
1	3	Subgrade	41.0	36.9	50.3	64.3	80.1	--
		Base	59.3	51.6	61.6	91.4	114.0	132.1
		Surface	114.5	64.2	55.0	70.5	114.0	143.4
1	4	Subgrade	38.5	40.5	49.0	62.7	81.6	--
		Base	78.0	57.4	69.3	95.6	122.2	140.2
		Surface	121.1	72.2	61.9	78.5	117.6	150.9
2	1	Subgrade	46.3	44.5	53.4	55.1	62.2	--
		Base	115.7	89.6	87.4	97.6	102.9	103.4
		Surface	306.8	166.0	126.2	125.5	138.4	135.6
2	2	Subgrade	48.3	39.6	46.9	61.5	80.7	--
		Base	82.2	71.0	71.6	88.2	116.2	135.7
		Surface	285.8	152.4	116.6	116.5	144.6	182.0
2	3	Subgrade	58.2	58.5	78.9	107.4	133.2	--
		Base	106.5	90.9	87.0	107.2	138.2	158.6
		Surface	340.2	184.8	139.8	137.6	163.6	196.2
2	4	Subgrade	54.7	42.2	52.9	74.3	102.5	--
		Base	121.1	88.5	81.4	96.9	127.4	150.5
		Surface	365.5	205.3	158.0	157.3	181.9	206.1

1 MPa = 145.038 lb/in^2
1 mm = 0.03937 in

The coefficient k2 must be zero or positive since a negative k2 would imply a decreasing modulus with increasing confinement which is not rational for paving materials. A k2 of zero reduces the model to the widely used relationship for cohesive materials. Thus, the model can be used to describe the behavior of a wide range of materials.

For the PTF subgrade, the NDT suggests the modulus behavior was influenced more by the deviatoric stress effect for typical in-situ stress conditions. The PTF subgrade should, therefore, be viewed as a stress softening material. This type of subgrade behavior has a major impact on layer moduli backcalculated using typical linear elastic basin analysis methods. The subgrade modulus which optimizes the linear elastic solution, typically provides a good match between measured and predicted deflections at large radial offsets. Thus, the backcalculated subgrade modulus would be representative of the subgrade in a state of low shear stress. Considering equation 2 and the distribution of stresses, the backcalculated subgrade modulus would be stiffer than that occuring near the loaded area where the shear stresses are significantly higher. To match the deflection under the load plate, the overestimation of the subgrade modulus under the loaded area would be compensated by an underestimation of the modulus of the other pavement layers. A typical result of this compensating effect would be backcalculated base course moduli which are unrealistically low. The introduction of a rigid layer at depths of 3 to 6 m (10 to 20 ft) or dividing the subgrade into several layers can sometimes result in more realistic backcalculated moduli.

Attempts to backcalculate layer moduli for the NDT data collected on the base course and the completed pavement resulted in unrealistically low base course moduli due to the nonlinear subgrade effect described above. The composite moduli in table 10, however, provide a means of comparing the initial structural capacities of the various test sections. The average composite modulus difference, defined as the difference between the completed pavement composite modulus and the subgrade composite modulus directly under the load plate, is summarized in table 11. A greater composite modulus difference implies a higher initial structural capacity. Also presented in table 11 are equivalent thicknesses of granular material which were obtained by transforming the asphalt layer into an equivalent thickness of granular material using equation 3.

$$t_{eq}=t_{cab}+t_{ac}\sqrt[3]{\frac{E_{ac}}{E_{cab}}} \qquad (3)$$

where

t_{eq} = equivalent granular thickness
t_{cab} = crushed aggregate base thickness
t_{ac} = asphalt concrete thickness

E_{cab} = crushed aggregate base modulus (assumed 207 MPa (30 ksi))
E_{ac} = asphalt concrete modulus (assumed 1103 MPa (160 ksi) psi at 32.2 °C (90 °F))

Comparing the composite moduli and thicknesses in table 11 shows, the composite modulus difference correlates well with the equivalent granular thickness. Thus, the NDT confirms the between test section variability described previously. This variability should be considered when evaluating the pavement performance data by using the average thicknesses of table 1.

AASHTO NDT Method 2 provided a means for estimating the effective in-situ subgrade moduli for the phase 1 test sections. In NDT Method 2, the pavement deflection at the middle of the load plate was related to the subgrade modulus and the structural number of the pavement through equation 4.

Table 11. Average composite moduli.

Lane	Section	Equivalent Granular Thickness, mm	Composite Modulus Difference, MPa	Surface Temperature °C
1	1	335	48.2	34.4
1	2	343	66.8	33.9
1	3	341	73.5	33.9
1	4	350	82.6	33.3
2	1	597	260.5	31.1
2	2	586	237.5	31.1
2	3	625	282.0	31.7
2	4	635	310.8	30.6

1 MPa = 145.038 lb/in^2
1 mm = 0.03937 in
°C = 5/9(°F-32)

$$d_0=\frac{2P(0.0043h_t)^3}{\pi a_c SN^3}[1+F_b(\frac{SN^3(1-\nu_s^2)}{E_s(0.0043h_t)^3}-1)] \tag{4}$$

where

$$F_b=[\sqrt{1+(\frac{h_e}{a_c})^2}-\frac{h_e}{a_c}][1+\frac{\frac{h_e}{a_c}}{2(1-\nu_s)\sqrt{1+(\frac{h_e}{a_c})^2}}]$$

$$h_e=(209.3)SN[\frac{(1-\nu_s)^3}{E_s}]^{\frac{1}{3}}$$

$$a_i=0.0043[\frac{(E_i)}{(1-\nu_i^2)}]^{\frac{1}{3}}$$

E_s = subgrade modulus
E_i = modulus for layer i
ν_s = subgrade Poisson's ratio
ν_i = Poisson's ratio for layer i
a_c = plate radius
P = applied load
SN = structural number
h_t = total pavement thickness
a_i = structural coefficient

Equation 4 was derived using the method of equivalent thicknesses and the Palmer/Barber closed form solution for the deflection of a two layer system. Appendix PP of Volume 2 of the 1986 AASHTO Guide for Design of Pavement Structures presents details of the derivation.(5)

From the as-constructed thicknesses in table 1 and the NDT data collected during construction (appendix A), estimated subgrade moduli were computed from equation 4. The structural coefficents used in the analysis were 0.14 and 0.24 for the crushed aggregate base and asphalt concrete, respectively. Assuming Poisson's ratio to be 0.35, these coefficeints correspond to crushed aggregate base and asphalt concrete moduli of 207 MPa (30 ksi) and 1103 MPa (160 ksi) which were considered reasonable for the conditions during the construction NDT. Table 12 summarizes the subgrade moduli obtained from this analysis for NDT conducted on the base and completed pavement. These moduli are combined with those from the subgrade NDT in figure 3. Clearly, the estimated subgrade modulus increases with increasing structural capacity which is expected for a stress softening subgrade material.

Table 12. Estimated in-situ subgrade moduli.

Lane	Sec	Location	Structural Capacity	Subgrade Modulus, MPa (ksi)
1	1	Base Surface	0.63 1.83	44.8 (6.50) 41.4 (6.00)
1	2	Base Surface	0.67 1.87	55.2 (8.00) 48.3 (7.00)
1	3	Base Surface	0.77 1.92	41.4 (6.00) 48.3 (7.00)
1	4	Base Surface	0.91 1.92	55.2 (8.00) 48.3 (7.00)
2	1	Base Surface	1.58 3.26	82.7 (12.00) 189.6 (27.50)
2	2	Base Surface	1.57 3.20	62.0 (9.50) 168.9 (24.50)
2	3	Base Surface	1.65 3.40	68.9 (10.00) 196.5 (28.50)
2	4	Base Surface	1.79 3.47	86.2 (12.50) 213.7 (31.00)

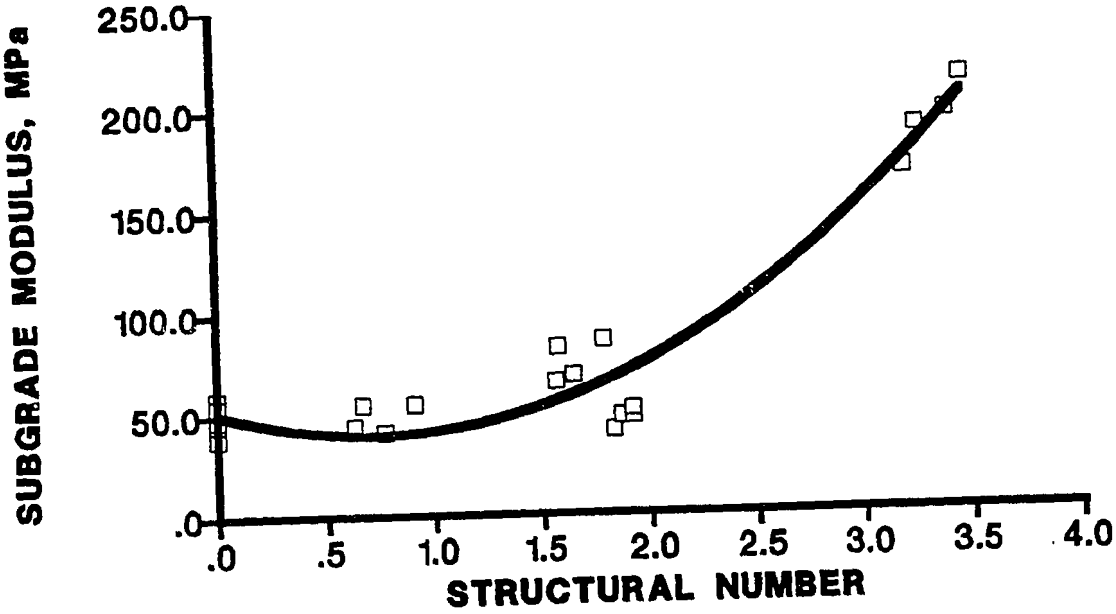


Figure 3. Variation of subgrade modulus with structural capacity.

The relationship shown in figure 3 provides a reasonable estimate of the variation of the modulus of the PTF subgrade soil with strucutral capacity. It should be noted that in AASHTO NDT Method 2, the structural capacity is related to the pavement rigidity through equation 5. Thus, the abscissa in figure 3 can be replaced with pavement rigidity.

$$Eh^3=\left(\frac{SN}{0.0043}\right)^3(1-\nu^2) \qquad (5)$$

INSTRUMENTATION

Instrumentation forms an integral component of the PTF. During the first phase of research, various instruments were installed to monitor environmental conditions and to measure pavement responses. A computer data acquisition system was assembled and customized software was developed for acquiring, reducing, and storing data.(2) The sections below summarize the instrumentation installed at the PTF during the Phase 1 research program.

Environmental

Environmental conditions have a major influence on the structural response and performance of pavement sections. Since the PTF does not provide environmental control, environmental conditions were monitored during pavement testing to aid in the interpretation of the test results. The environmental instrumentation installed during the Phase 1 research program included:

- Portable weather station.
- Subgrade moisture cells.
- Thermocouples.

The portable weather station was used to monitor ambient air temperatures and precipitation. The daily maximum and minimum air temperatures and daily precipitation were stored in the environmental database. Additional climatic data may be obtained from the National Oceanic and Atmospheric Administration (NOAA) weather stations at Dulles International and Washington National Airports, which are both located within approximately 40 km (25 mi) of the PTF.

Moisture conditions have a significant effect on the strength and stiffness of subgrade soils. Therefore, to monitor variations in moisture content during the phase 1 research, several resistance type moisture cells (Soiltest Model MC-373) were installed at various depths in the subgrade. These cells operate on the principle that the resistance of the cell changes with variations in the moisture content of the soil in which they are installed. The resistance of the cell is also a function of soil type, density, and temperature; therefore, careful calibration and installation are necessary for accurate measurement of soil moisture content. Considering the uncertainties associated with calibration and installation, the accuracy of the absolute moisture content measured with these cells was questionable. However, they were considered acceptable for monitoring gross changes in moisture content. The data from the moisture cells were supplemented with oven-dried moisture contents obtained after each test section failed.

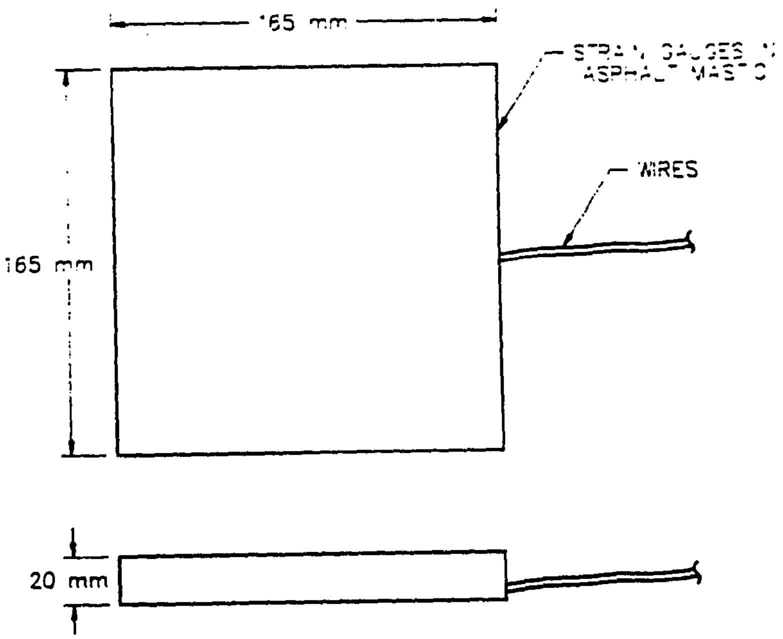
Load induced responses of asphalt concrete pavements are greatly affected by the temperature of the asphalt layers. Thermocouples (Type T) were, therefore, installed at various depths in the asphalt layers to monitor pavement temperatures. To obtain a detailed temperature history for each performance test, the data acquisition system recorded the thermocouple temperatures hourly as the ALF testing machine trafficked the pavement. Additionally, the thermocouples were monitored during any load response testing conducted during the phase 1 research program.

Pavement Response

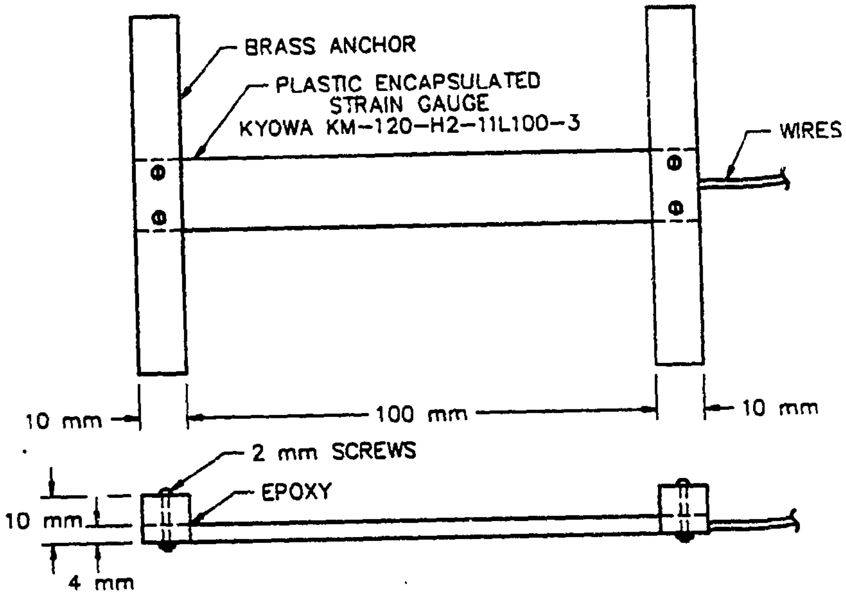
Over the past 30 years, advancements in pavement research have resulted the development of mechanistic pavement design and analysis procedures. These procedures use performance prediction models which relate pavement damage to load induced stresses or strains in the pavement structure. Various pavement response instrumentation was used at the PTF to collect data to verify and improve mechanistic performance prediction models. The following pavement response instrumentation was included in the first phase of research:

- Strain gauges.
- Surface deflectometer.
- Surface profiler.

Most prediction models for fatigue damage in asphalt concrete pavements relate fatigue damage to the tensile strain at the bottom of the asphalt layer. To measure this strain, several strain gauges were installed at the interface between the crushed aggregate base and the lower lift of asphalt concrete. Two types of gauges were used. The first, developed in Canada, consisted of wire resistance strain gauges embedded in an asphalt mastic to form a 165-mm (6.5-in) square transducer which was approximately 20 mm (0.80 in) thick as shown in figure 4.(6) Six of these gauges were installed in the phase 1 test sections. The second, commonly referred to as an "H" gauge was initially developed in Europe.(6) The version installed at the PTF consisted of a wire resistance strain gauge encapsulated in a plastic strip to which two brass anchors were attached. As shown in figure 4, the completed transducer had the shape of the letter "H" with a 51-mm (2-in) active gauge length. A total of 24 of these gauges were installed in the phase 1 test sections.



a. Canadian strain gauge.



b. "H" type strain gauge

Figure 4. Strain gauges installed in phase 1 test sections.

All of the strain gauges were operational immediately after construction; however, the durability of both types of gauges was poor. Several gauges failed due to environmental effects prior to traffic loading. These failures were typified by a gradual increase in gauge resistance. Other gauges failed during traffic loading. These failures resulted in an abrupt loss of continuity due to broken gauges or lead wires. Blocks of asphalt concrete containing selected gauges were recovered during post-failure investigations and examined. These examinations revealed a problem with the "H" gauges. During warm weather tests, the "H" gauges tended to loosen as a result of traffic loading. Apparently, the gauges were stiffer than the asphalt concrete when the pavement was hot causing the gauges to loosen under repeated loading. For "H" gauges which remained tightly bonded, comparisons of measured and theoretical strains showed reasonable agreement; however, the loose "H" gauges, and the asphalt mastic gauges consistently yielded strains which were significantly less than the theoretical strains.(7) For detailed information concerning strain gauges, refer to references 6 and 8.

Only sections 2 and 3 of each lane were instrumented with strain gauges during construction. Lane 2, section 1 was retrofitted with strain gauges using a technique developed in Finland.(6) Foil resistance strain gauges were mounted to the bottom of a core removed from the pavement. The core was subsequently bonded into the pavement with epoxy. Figure 5 is a schematic of the retrofit core installation. To minimize the thickness of the epoxy, the strain gauges were attached to a 102-mm (4.0-in) diameter core obtained from an untrafficked area of the pavement using a nominal 108-mm (4.25-in) diameter diamond core barrel. A 102-mm (4.0-in) hole was then cut in the pavement at the instrumentation location using a nominal 102-mm (4.0-in) diamond core barrel. After trafficking the test section to failure with over 1.2 million load repetitions, 203-mm (8-in) cores containing the instrumented cores were removed and inspected. Cross sections cut through the cores using a concrete saw revealed the installation method provided a uniform, thin annulus of epoxy approximately 1-mm (1/32-in) thick. No cracks were observed in the pavement surface near the cores. The strain gauges remained operational for over 1 million load repetitions.

Wire resistance strain gauges were also installed at the pavement surface for a special tire pressure experiment conducted as part of the phase 1 research program.(9) These gauges were bonded in 3 mm (1/8 in) deep slots cut in the pavement surface. The gauges were removed upon completion of the experiment. See reference 9 for additional information concerning the surface strain gauge installation.

For many years, surface deflections have been used in the structural evaluation of flexible pavements. The magnitude of the maximum surface deflection is an indicator of the structural capacity of the pavement. To measure defections directly under the ALF wheels required the installation of deflection gauges in the pavement structure.

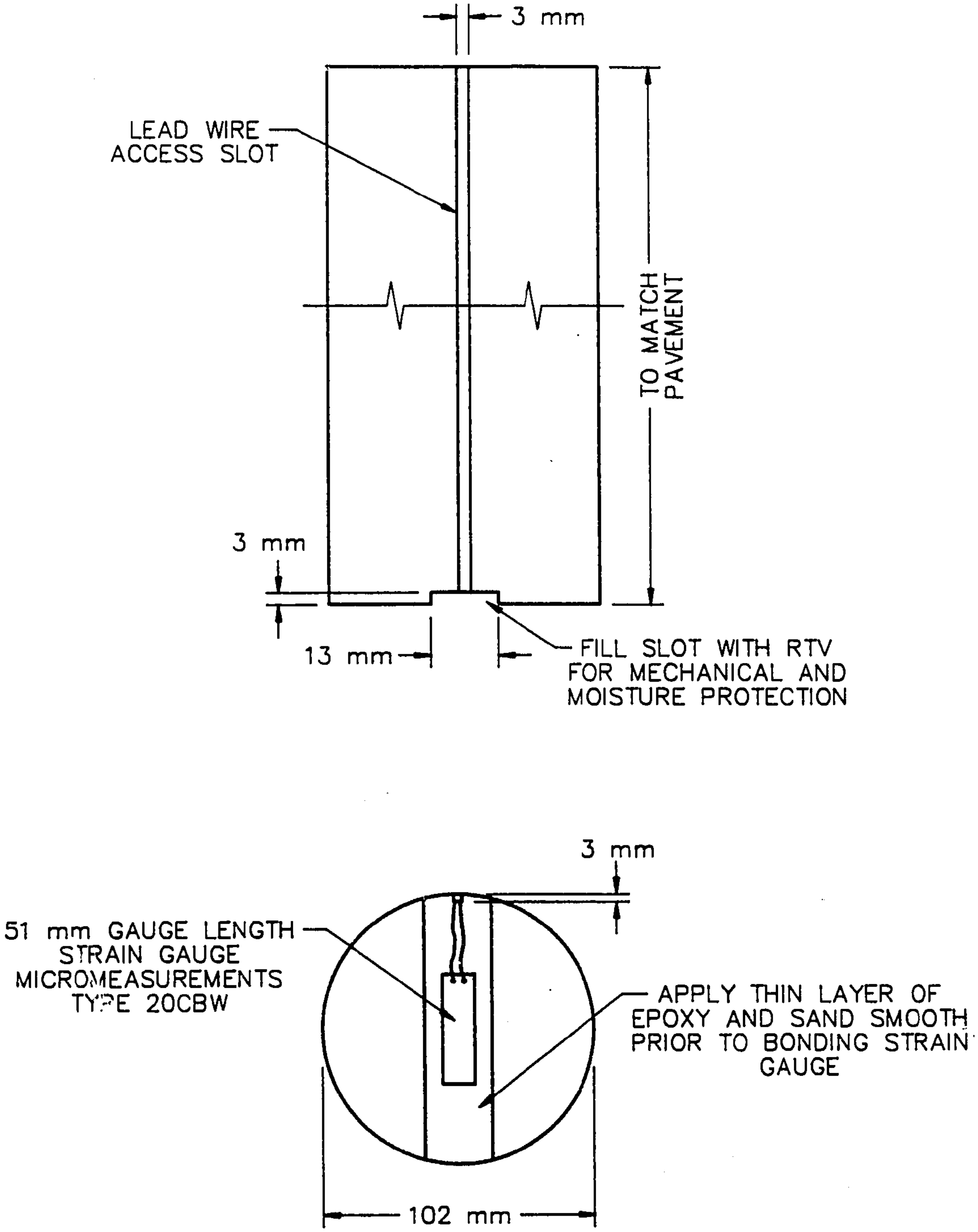


Figure 5. Schematic of retrofitted strain gauges.

Several types of in-situ deflection gauges have been developed and used in past research efforts; however, the installation of these devices required a 38 to 102-mm (1.5 to 4-in) diameter hole through the pavement. Since holes of this size would probably induce pavement failure during accelerated loading, in-situ deflection gauges were not installed during the phase 1 research program. Instead, surface deflections were monitored with a linear variable differential transformer (LVDT) mounted at the end of a 2.74-m (9-ft) long cantilever reference beam. With this arrangement, deflections could only be measured at distances greater than 0.66 m (26 in) from the center of the dual wheels. At these distances from the load, the measured surface deflection is influenced mainly by the stiffness of the subgrade. Thus, deflections obtained with the cantilever beam device monitored the condition of the subgrade. The condition of the other layers were obtained through periodic testing with a falling weight deflectometer.

In recent years rutting in asphalt concrete pavements has become a subject of great concern. To permit frequent and accurate measurements of rutting during performance testing, the semiautomatic surface profiler shown in figure 6 was designed and constructed. This device uses a linear potentiometer to measure the elevation of the pavement surface relative to a plane defined by two reference beams mounted along the edge of the pavement. The potentiometer is mounted to a carriage which can be moved in both the transverse and longitudinal directions. Two shaft encoders monitor the position of the carriage. Pavement rutting and roughness were obtained from profiles in the transverse and longitudinal directions, respectively.

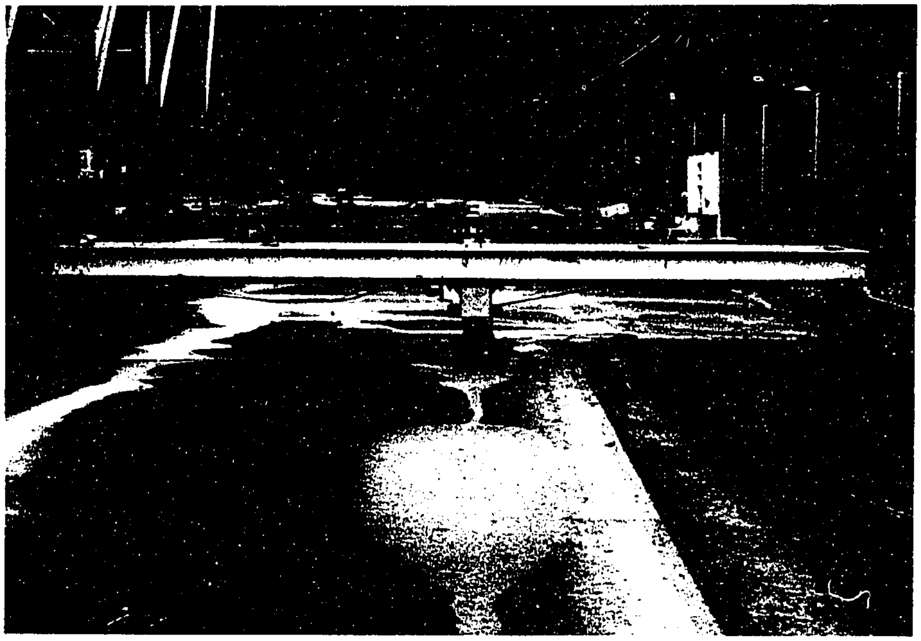


Figure 6. Photograph of surface profiler.

SUMMARY

This chapter presents background information concerning the configuration of the PTF during the first phase of research. It contains design and as built pavement thicknesses, as well as a summary of the results of laboratory and in-situ material property tests. This chapter also describes the environmental and pavement response instrumentation used during the first phase of research. Important factors to consider when analyzing pavement response and performance data from the phase 1 test sections are the nonlinear, stress softening subgrade behavior, and the between section variation in pavement thicknesses. The thicknesses presented in table 1 are recommended for future analyses.

CHAPTER 3. DATA COLLECTION

ACCELERATED LOADING FACILITY

Traffic loading was applied to the PTF test pavements with the ALF shown in figure 7. The ALF was delivered to the PTF in September 1986, and the first several weeks of operation were devoted to shakedown testing of the ALF, the PTF computer data acquisition system, and the general PTF operating procedures. The shakedown testing was performed on lane 1, section 3 with the ALF operated 8 hours per day, 5 days per week. At the end of the shakedown period, the ALF was moved to lane 2, section 3 to begin the pavement research testing. The operational goal for the first research test was to expand the ALF loading to 24 hours per day 7 days per week. Both nighttime and weekend operation took advantage of the ALF computer control system with no staff on site. To monitor the progress toward this goal, a detailed time log was maintained. Three categories were established for monitoring the productivity of the ALF: operating, failure, and standby time. Operating time accrued when the ALF was applying loads to the test pavement. Failure time occurred when the ALF machine was inoperable due to a failure of some component on the ALF or the computer control system. Standby time indicated the ALF was operable, but was not in operation for one or more reasons, including routine maintenance of the ALF, pavement condition monitoring, or unavailability of operators.

The average productivity statistics for the first pavement test were 37.5 percent operating, 8.5 percent failure, and 54.0 percent standby based a total of 168 hours per week. The majority of the standby time accrued on weekends when the ALF would shutdown due to an error detected by the computer control system, and no operators were available to restart the machine. Throughout the phase 1 research program, the standby time was continuously reduced to the point where 65 percent operating, 7 percent faliure, and 28 percent standby became the typical productivity statistics for the phase 1 tests. These numbers translate into approximately 40,000 load repetitions per week. The increased productivity was achieved primarily through an increased familarity with the ALF machine and the establishment of an inventory of frequently replaced parts.

For the phase 1 tests, the ALF simulated one-half of a dual-tire, single axle with loads ranging from 41.8 to 100.1 kN (9,400 to 22,500 lb). The wheel assembly traveled 18.5 km/h (11.5 mi/h) over a 9.8-m (32-ft) test section. To simulate highway traffic, the loads were applied in one direction and were laterally distrubuted. The lateral distribution used in the phase 1 tests was a normal distribution with a standard deviation of 133 mm (5.25 in). This distribution was truncated at 375 mm (14.75 in), the maximum permissible lateral movement of the ALF. Figure 8 shows the geometry of the dual tire assembly used to apply the test loads. The centerline of the trolley moved through the lateral position distribution, resulting in a wheelpath of 1.3 m (4 ft).

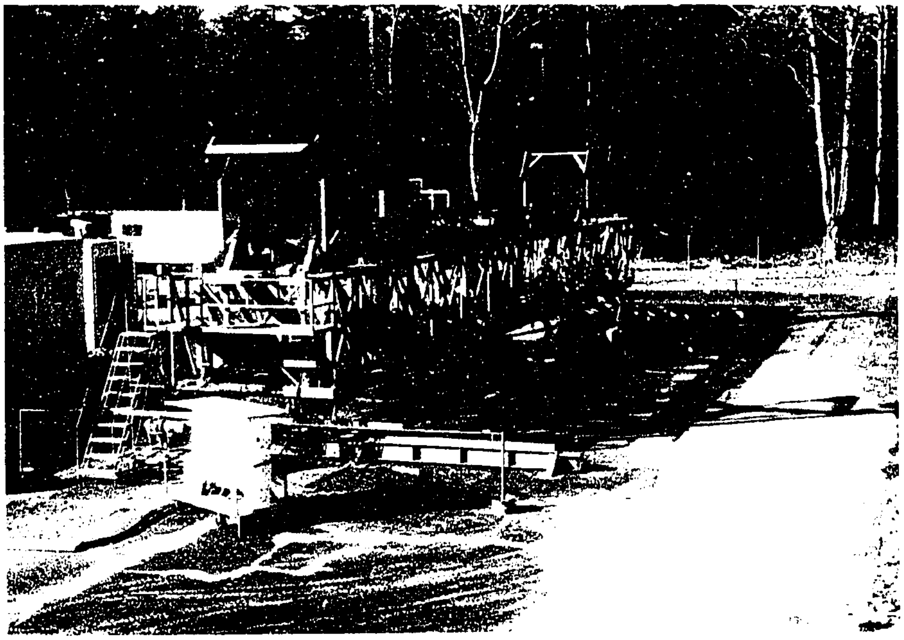


Figure 7. Photograph of the Accelerated Loading Facility.

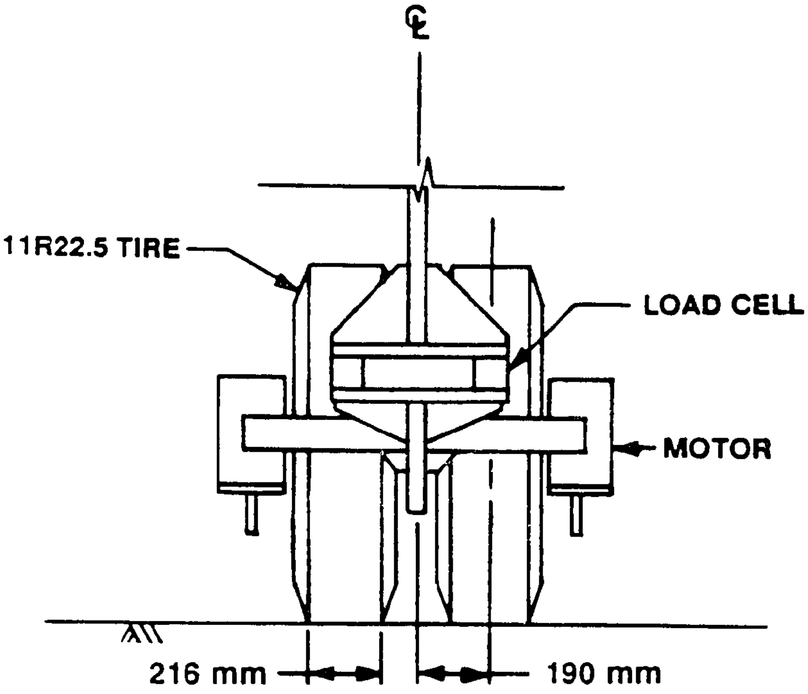


Figure 8. Geometry of the ALF dual wheel assembly.

Figure 9 depicts the manner in which the ALF trolley loads the pavement. The load on the test wheels was provided by ballast weights, each weighing approximately 10 kN (2,250 lb). The minimum weight of 41.8 kN (9,400 lb) was obtained by removing all of the weights and lifting the swinging arm in figure 9. In this configuration, the ALF had no suspension system. With the addition of the first ballast weight, an air bag and shock absorber system was added to the trolley assembly. At 84.5 kN (19,000 lb), the suspension system acted on approximately 50 percent of the load.

The loading characteristics of the ALF changed as the sprung load increased from approximately 0 to 40 kN (0 to 9,000 lb). Figure 10 shows the variation of the load with longitudinal distance for three of the ALF load levels. These loads were measured with load cells mounted in the trolley assembly. As can be seen in figure 10, the ALF applied a significant dynamic load component. The dynamic load component was largest at the lighter loads when most of the weight was not acted on by the suspension system. This dynamic loading effect was reflected in the pavement performance data and is discussed further in later sections.

During the phase 1 research effort, the ALF was used in two modes of operation: response testing and accelerated loading. The response testing mode used the ALF's variable loading and lateral position capabilities and the pavement instrumentation. The ALF was manually positioned at a specified location relative to the pavement instrumentation. Then several load cycles were applied while the instrumentation was monitored. During the first phase of research, response data were collected for a variety of loads, tire pressures, and transverse positions. These data formed a key component of the tire pressure study completed during the phase 1 research effort.(9) A jib crane was designed; fabricated and installed on the ALF to facilitate the changing of the ballast weights during response testing. In the accelerated testing mode, the load and tire pressure were kept constant, and the ALF was operated 24 hours per day, 7 days per week. Pavement performance data were collected periodically during the accelerated load testing. Nighttime and weekend operation were performed by the ALF computer control system with no staff on site. During the phase 1 research effort, the facility was staffed with two operators, each working a normal 40-hour week. A spare parts inventory was established to maintain high productivity. With the spare parts inventory, worn or defective parts were replaced immediately to return the ALF to service. After the ALF was operating, the replaced part was overhauled and returned to the spare parts inventory. If the part could not be overhauled, a replacement was purchased. The spare parts inventory was periodically updated based on parts availability and maintenance history.

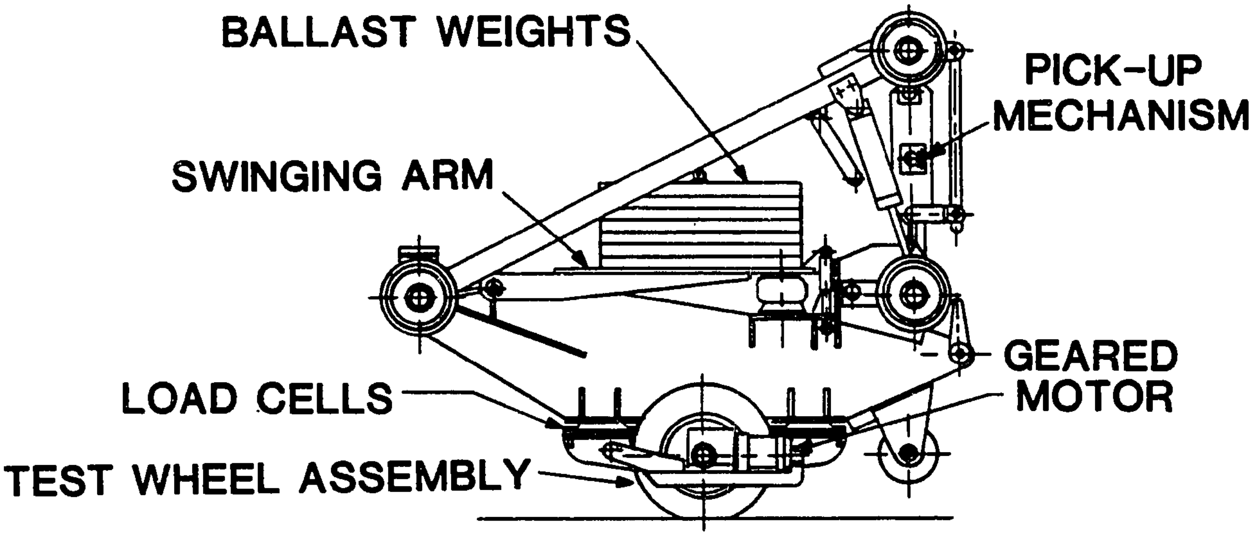


Figure 9. ALF trolley assembly.

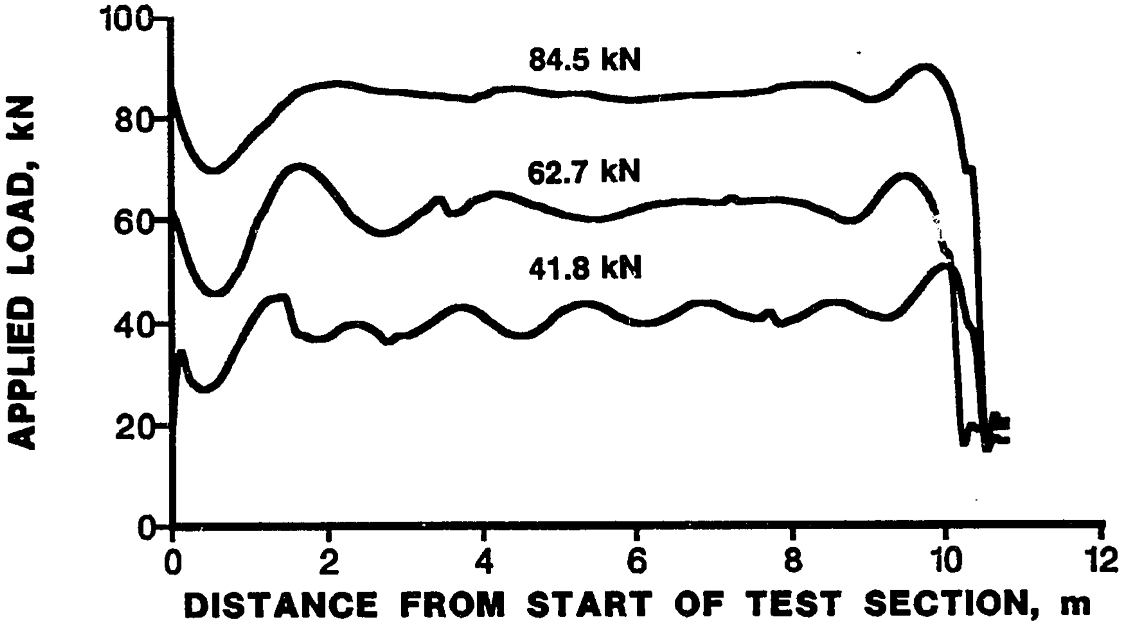


Figure 10. Typical ALF loading.

PAVEMENT PERFORMANCE MONITORING

The objective of the pavement performance monitoring at the PTF was to quantify the accumulation of structural and functional distresses in the pavement test sections. Additionally, these observations under carefully controlled loading conditions provide insight for a better understanding of the distress mechanisms in flexible pavements.

Two obvious measures of the structural distress in a pavement are the accumulation of cracking and rutting at the pavement surface. Cracking and rutting data were obtained periodically during the accelerated load tests conducted as part of the first phase of research. Upon completion of each test, postfailure investigations were conducted to document the condition of each pavement layer at failure. Changes in structural capacity resulting from the ALF load applications were also quantified through periodic nondestructive testing with a falling weight deflectometer. Additionally, an attempt was made to use in-situ strain measurements under the ALF load as a measure of the structural condition of the pavement. This last method met with limited success as much of the instrumentation failed early in the life of the pavement.

The AASHTO serviceability concept was used to quantify the functional distress in terms of present serviceability index (PSI). The PSI is a measure of the functional condition of a pavement at any time during its life, and is obtained from measures of roughness, cracking, and rutting.

Cracking

A manual procedure was used to measure cracking for the phase 1 test sections. Periodically, a clear sheet of plastic was placed over the test section and the cracks were traced onto the plastic. The test section was then divided into eight 1.22-m (4-ft) long by 1.83-m (6-ft) wide subsections as shown in figure 11. Two methods were used to quantify the amount of cracking. First, the total length of cracking in each subsection was carefully measured with a map wheel. Since the total surface area over which the cracking was measured remained constant, the increase in total crack length with traffic represented the increase in crack density within the test section. The second method was the standard AASHTO method which includes the surface area of AASHTO class 2 and class 3 cracking.(10) Typical accumualtions of cracking by the two methods are shown in figure 12. From this figure it is apparent that the total crack length method is more sensitive to small amounts of cracking than the AASHTO prodecure. Measurements based on the AASHTO procedure were necessary for the computation of PSI.

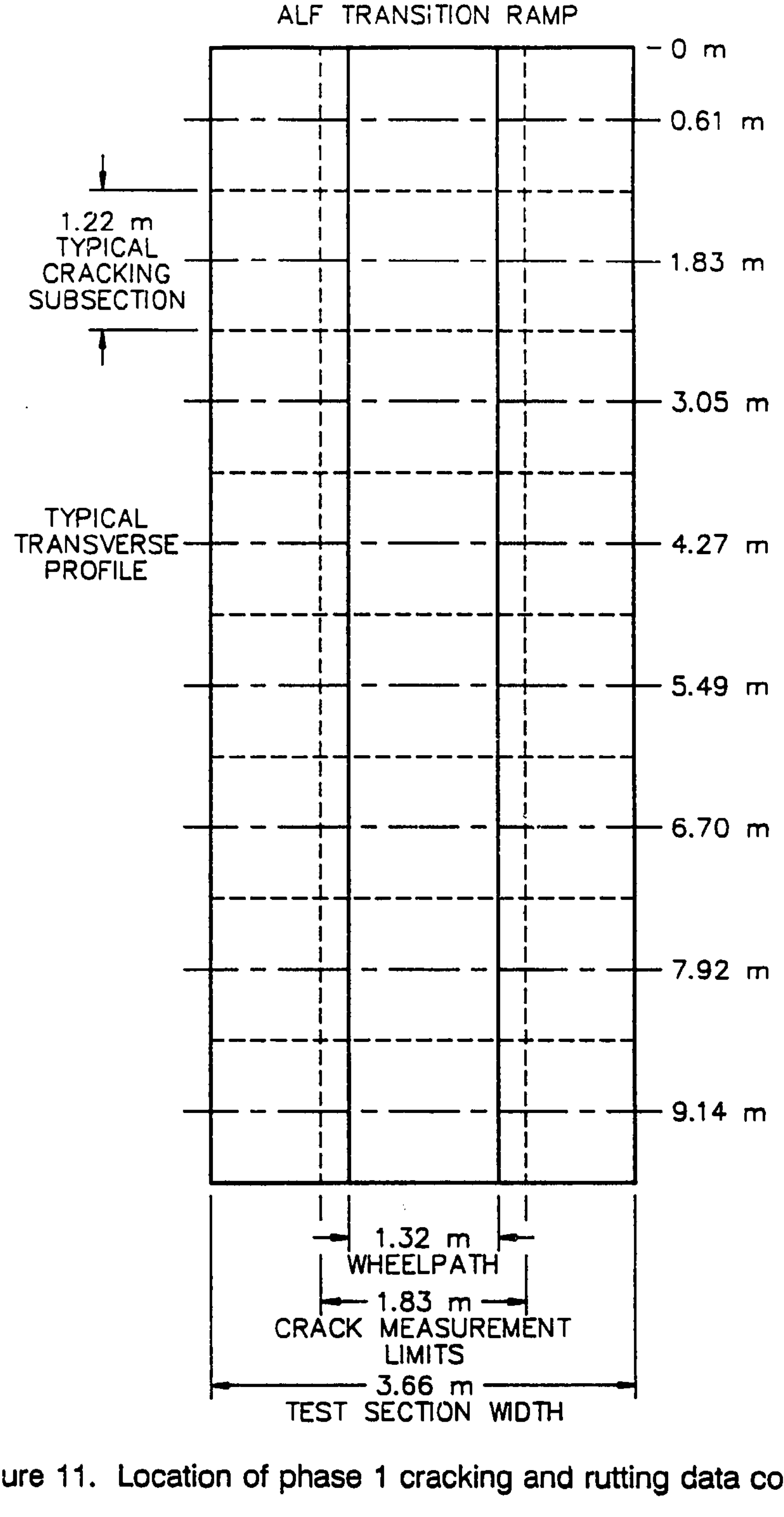


Figure 11. Location of phase 1 cracking and rutting data collection.

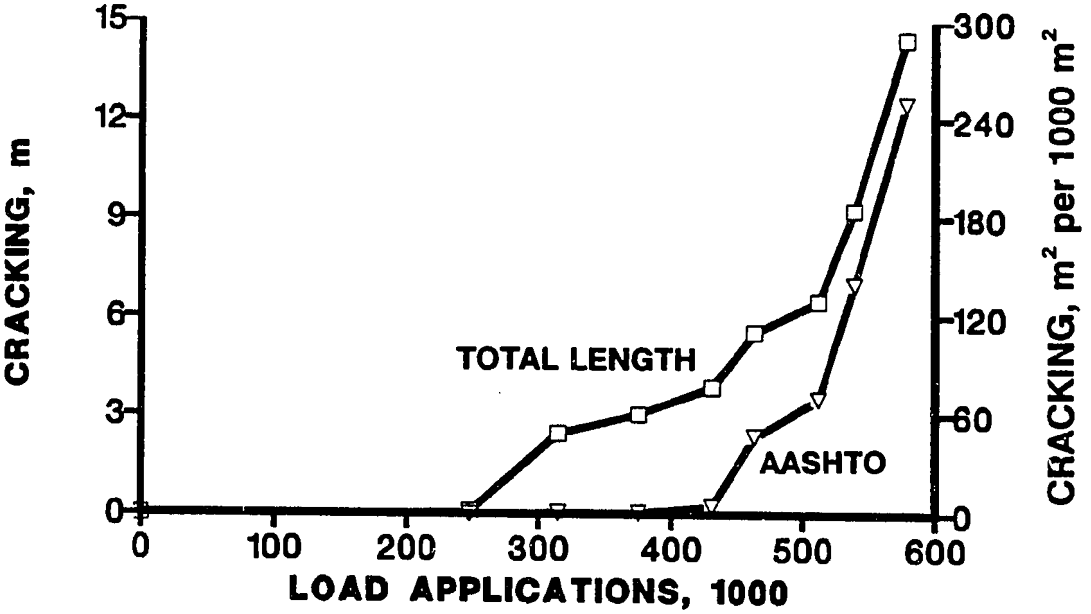


Figure 12. Comparison of the sensitivity of crack measuring methods.

Rutting

For the first two pavement tests, (lane 2, section 3 and lane 2, section 2), rutting was obtained by differential leveling conducted periodically during each test. As shown in figure 11, rut depths were obtained at the center of each of the 8 subsections used for measuring cracking. At each of these locations, the elevation of the pavement surface was measured every 153 mm (6 in) across the pavement to produce a transverse profile. To eliminate initial surface irregularities from the rut depth data, profiles obtained before trafficking were used as references. Subsequent profiles were subtracted from the appropriate reference to obtain a corrected profile. The rut depth was then calculated from the corrected profiles as shown in figure 13. The differential survey method proved to be very time consuming; therefore, to obtain rutting data more frequently, the semiautomatic profiling device described previously was developed. This device eliminated the need for survey measurements and directly measured the profile of the pavement surface relative to a fixed reference at 25 mm (1 in) spacings. The rut depth was then obtained from the profiles as outlined above for the differential suvey procedure.

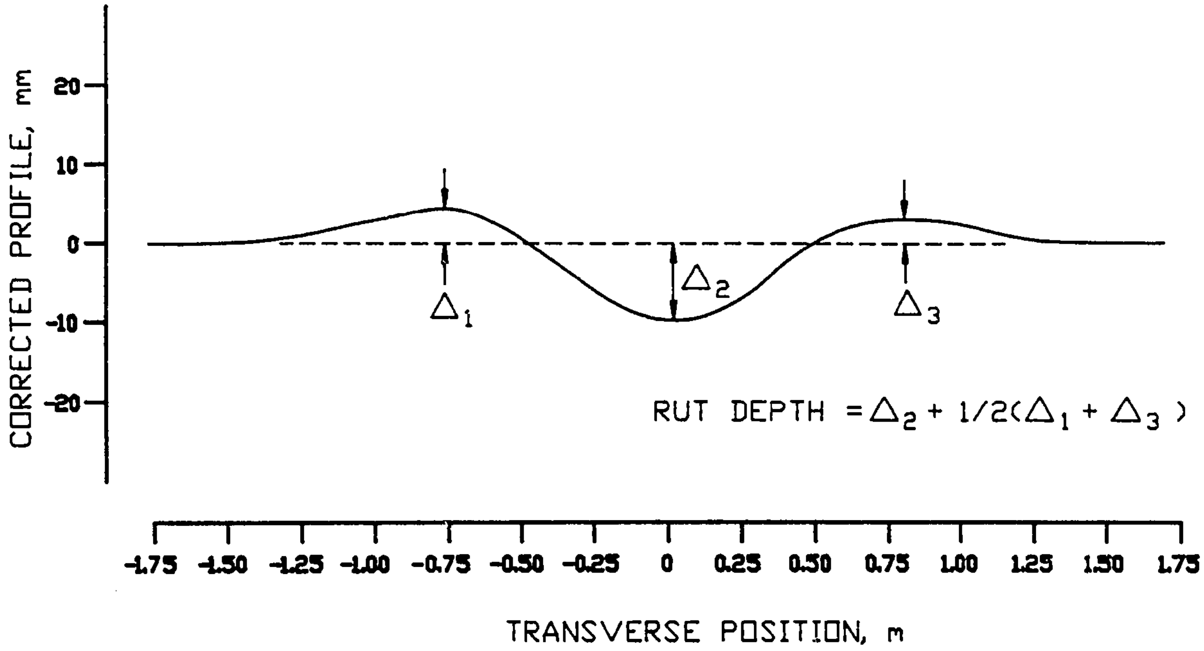


Figure 13. Calculation of rut depth from pavement profile.

Roughness

Longitudinal roughness is the primary variable in the calculation of the PSI for a pavement. In the development of the AASHTO PSI equation, roughness was quantified using slope variance which is the statistical variance of a series of pavement slope measurements. At the AASHO Road Test, the pavement slope, based on a separation distance of 229 mm (9 in), was recorded continuously using a profilometer. The slope at 305 mm (12 in) intervals was then used to compute the slope variance.(10)

For the first two pavement tests of the Phase 1 research program, slope variance was obtained from differential survey data collected at 305 mm (12 in) spacings along the centerline of the test sections. Like the rutting measurements, the computation of slope variance using manual survey data was very tedious, but more importantly, survey errors, which could be as large as 0.25 mm (0.01 in), had a significant influence on the computed slope variance. With the addition of the semiautomatic profiling device at the beginning of the third pavement test (Lane 1, Section 2), the measurement of slope variance was greatly simplified and the reliability of the slope measurements increased. Using this device, the longitudinal profile of the pavement surface relative to a fixed reference was obtained at 25 mm (1 in) spacings.

The pavement slope for a 229-mm (9-in) separation distance was then calculated at each point, and the slope variance was computed as the variance of all the computed slopes.

Present Serviceability Index

The AASHTO serviceability concept was used to quantify the functional condition of the phase 1 test pavements. The basis of the AASHTO serviceability concept is the present serviceability rating (PSR) which is a rating, on a scale of 0 to 5, assigned to the pavement by a panel of experts based on the functional condition of the pavement at the time the rating was performed.(11) A rating of 5 indicates a perfect pavement while a rating of 0 is an exceedingly poor pavement. At the AASHO Road Test, the PSR was correlated with measurements of slope variance, rutting, and cracking and patching. The regression analysis resulted in the following predictive equation for estimating the PSR.(10) The estimated value of PSR was called the present serviceability index or PSI.

$$PSI = 5.03 - 1.91 \times \log_{10}(1+SV) - 1.38 \times RD^2 - 0.01 \times (C+P)^{0.5} \qquad (6)$$

where

SV = slope variance in 10^{-6}.
RD = average rut depth in inches. (1 in = 25.4 mm)
C+P = surface area of AASHTO Class 2 and 3 cracking and patching in $ft^2/1000\ ft^2$. (1 ft = 0.3048 m)

Using the above equation, the functional condition of the pavement can be estimated through a correlation with objective measurements. The PSI for the PTF test sections was computed during the phase 1 research to provide a common basis for describing the condition of the test pavements. A PSI of 3.0 has a specific meaning to pavement engineers, while the roughness or crack density may not. Figure 14 presents a typical PSI history from one of the Phase 1 test sections.

Nondestructive Testing (NDT)

For many years, NDT has been used as an integral part of the structural evaluation of flexible pavements. In pavement evaluation, NDT refers to the measurement of the surface deflection response of a pavement due to the application of a known load. This response can be used as an indicator of the structural capacity of the pavement, or it can be used to determine the in-situ modulus of the various pavement layers.

NDT was performed periodically with a falling weight deflectometer during the phase 1 research program. Two types of tests were performed. First, sections of the pavement which would not be trafficked were designated as reference locations, and NDT was conducted at these locations to establish benchmark deflections and in-situ

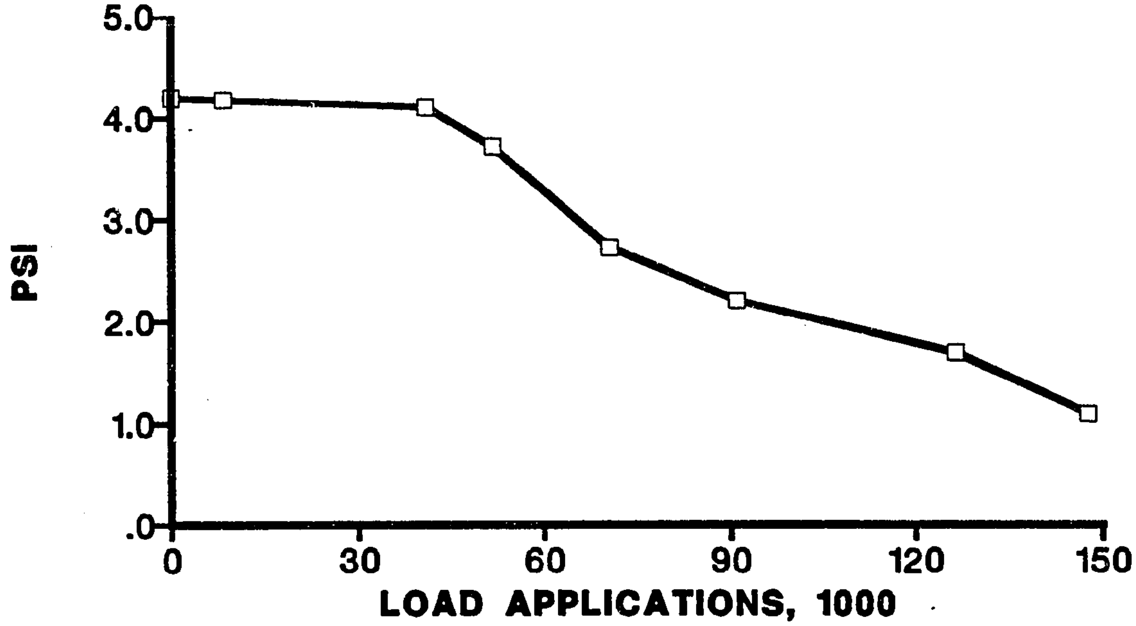


Figure 14. Typical PSI history from phase 1 test.

material properties. Testing at these reference locations also provided an indication of the effect of environment on the PTF test sections. The second type of NDT was designed to track the structural damage occurring in specific pavement test sections as a result of the ALF loading. For this testing, NDT was performed at designated locations, both in and out of the wheelpath, periodically as the test section was trafficked. Comparisons of deflections and structural capacity estimates were then used to quantify the structural damage occuring in the pavement.

Postfailure Investigations

Postfailure investigations were conducted after each of the phase 1 test sections was trafficked to failure. These investigations consisted of sawing the asphalt concrete, and excavating two trenches across the test section as shown in figure 15. The trenches were excavated in areas of the test section exhibiting average and above average distress. Transverse profiles were obtained at the top of the wearing course, the top of the crushed aggregate base course, and the top of the subgrade. These profiles were used to determine the amount of rutting attributable to each layer. The asphalt concrete was cored, both in and out of the wheelpath, and air void contents and resilient moduli were measured in the laboratory. In-situ density and moisture content measurements were obtained in the base and subgrade, and samples of these materials were removed for grain size analyses. The postfailure investigations proved to be valuable in documenting the failure for each of the phase 1 tests.

ENVIRONMENTAL MONITORING

Since the PTF is an outdoor facility with no means of controlling the environment, environmental conditions were monitored during each pavement test. Temperature and moisture conditions have a significant impact on flexible pavement performance. The strength and stiffness of asphalt concrete is affected by temperature, while moisture affects the strength of subgrade soils and granular base materials. To quantify thermal conditions, pavement temperatures at seven depths in the asphalt layer were monitored with thermocouples hourly as each pavement test progressed. Additionally, pavement temperatures were recorded during most of the NDT performed during the phase 1 research program. To quantify moisture conditions, a record of precipitation was maintained at the site. Additionally, moisture cells installed in the subgrade during construction were monitored periodically. The results of the NDT at the reference locations were also used to quantify the effect of changing environmental conditions on the in-situ material properties. Finally, subgrade and base course moisture contents were obtained during the postfailure investigations.

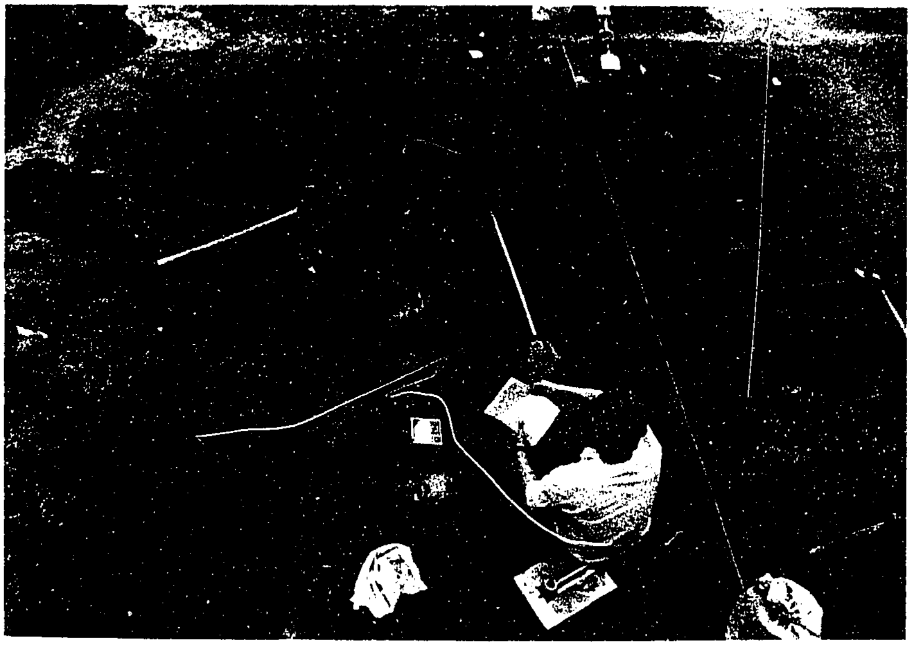


Figure 15. Photograph during postfailure investigation.

SUMMARY

This chapter provides a brief description of the ALF and its most important operational characteristics. It also describes the data collection procedures used during the first phase of research. Rutting, cracking, roughness, PSI, and NDT data were used to monitor the condition of the test pavements. After each test section failed, postfailure investigations were conducted to document the condition of the pavement layers at the time of failure. Finally, since the PTF had no environmental control, environmental conditions were monitored to aid in the interpretation of the pavement performance data.

CHAPTER 4. PAVEMENT TESTING RESULTS AND ANALYSIS

This chapter presents a summary of the environmental and pavement performance data for the phase 1 pavement tests. Seven of the eight phase 1 pavement test sections were included in the data base. Table 13 summarizes the load, tire pressure, testing period, and total number of load applications. Fatigue cracking was the predominant failure mode for the phase 1 tests. Excessive rutting in the test sections did not develop until after the asphalt concrete was severely cracked. Failure criteria were not established prior to testing the phase 1 sections; however, most of the pavements were tested well beyond the typical pavement engineer's definition of failure. The test on lane 2, section 1 was cut short due to time constraints, but significant rutting and the onset of fatigue cracking were still observed in this test. The results for lane 1, section 3 were omitted from the data base because this test section was used primarily for shakedown testing of the ALF testing machine. The sections below summarize the environmental and pavement performance data for each pavement test given in table 13.

Table 13. Summary of phase 1 pavement tests.

Period	Section	Load, kN	Pressure, kPa	Passes
01/08/87 - 06/04/87	Lane 2, Section 3	84.5	689	502,622
06/18/87 - 11/30/87	Lane 2, Section 2	84.5	965	578,142
12/14/87 - 02/18/88	Lane 1, Section 2	51.6	689	147,696
03/01/88 - 03/08/88	Lane 1, Section 4	73.0	689	14,240
03/24/88 - 04/04/88	Lane 1, Section 1	62.7	689	37,033
04/29/88 - 12/03/88	Lane 2, Section 1	73.0	689	1,125,385
01/09/89 - 02/23/89	Lane 2, Section 4	100.1	689	233,622

1 kN = 224.809 lb
1 kPa = 0.145038 lb/in^2

ENVIRONMENTAL

To aid in the interpretation of the pavement performance data, environmental conditions were monitored continuously during the first phase of research. Appendix B presents a daily listing of the environmental conditions at the site. Appendix B also presents NDT data collected at the untrafficked reference locations in lanes 1 and 2. Subgrade moisture conditions are of particular interest since pavement loads are ultimately carried by the subgrade, and the strength and stiffness of subgrade soils are greatly affected by moisture conditions. Figure 16 presents a plot of subgrade moisture contents as determined by moisture cell readings and oven dried samples. From this figure it is apparent that the moisture content of the subgrade increased from the as-constructed value of 10 percent to approximately 17 percent by January, 1987. It then remained relatively constant over the remainder of the testing period. Figure 17 shows a plot of subgrade moduli estimated from NDT conducted at untrafficked reference locations in lanes 1 and 2. The moduli were calculated from the outer sensor deflection and the Boussinesq deflection equation as outlined in chapter 2. Figure 17 shows a definite general trend of decreasing modulus with time. The NDT data were not collected often enough to discern definite seasonal variations in subgrade modulus. The nonlinear subgrade behavior described in chapter 2 accounts for the difference in the estimated moduli between lane 1 and lane 2.

Due to the nonlinear behavior of the PTF subgrade soil, the estimated moduli shown in figure 17 may be somewhat higher than those occurring directly under the ALF wheels. To obtain reasonable estimates of the subgrade modulus for performance prediction modeling and NDT structural capacity analyses, an analysis similar to that described in chapter 2 was conducted using the NDT data from the untrafficked reference locations. From the maximum deflection directly under the load plate, the subgrade modulus was calculated using NDT Method 2 and the structural capacity at the reference locations. The reference location structural capacity was calculated using the measured pavement thicknesses, a structural coefficient of 0.14 for the base course and asphalt structural coefficients consistent with the average pavement temperatures measured during the NDT testing. Figure 18 presents laboratory determined asphalt concrete moduli and asphalt concrete structural coefficients based on equation 7 which is used in the AASHTO NDT Method 2 analysis.

$$a_i = 0.0043\left[\frac{E_i}{(1-\nu_i^2)}\right]^{\frac{1}{3}} \qquad (7)$$

where

a_i = structural coefficient
E_i = resilient modulus
ν_i = Poisson's ratio (0.35 assumed)

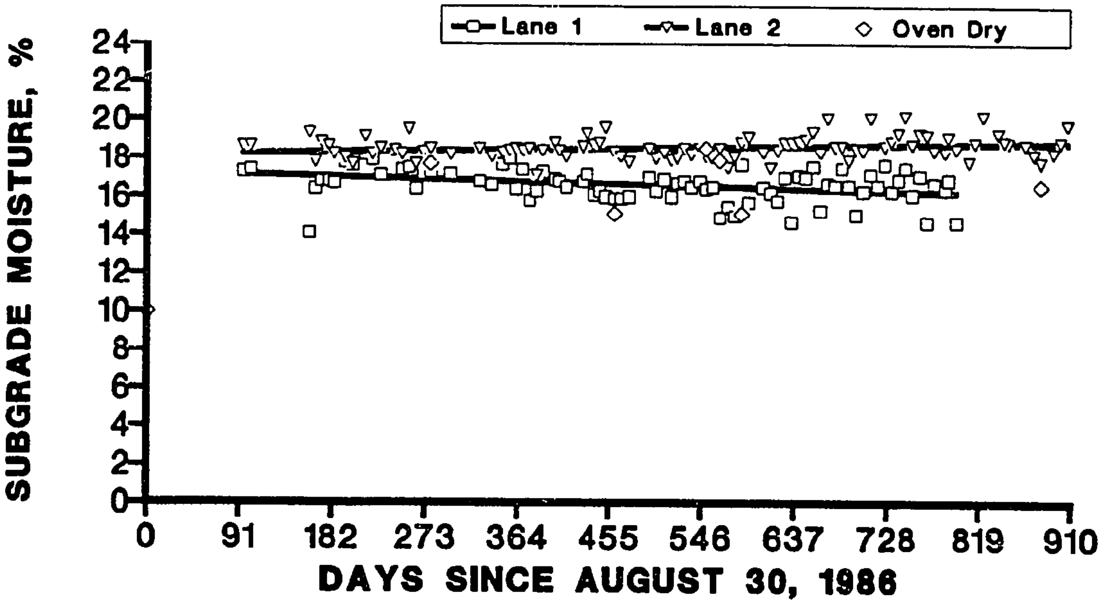


Figure 16. Subgrade moisture contents during phase 1 research.

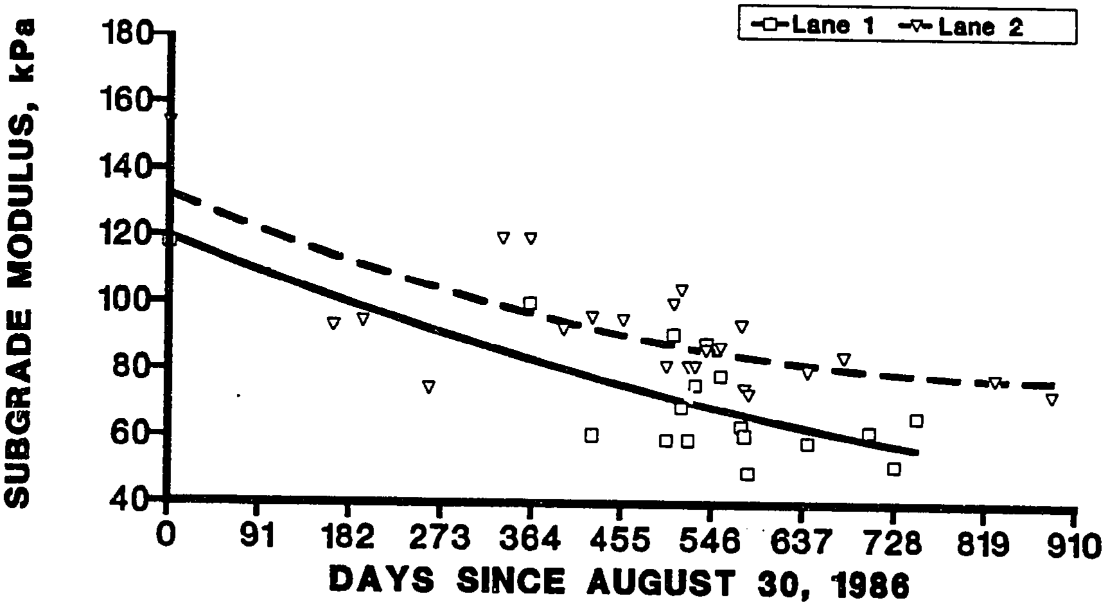


Figure 17. Estimated subgrade moduli from outer sensor NDT deflections.

The results of this analysis for the NDT reference location data base is shown in figure 19. The data base, which is presented in appendix B, contains 84 deflection measurements over a range of pavement temperatures from 0 to 43 °C. Also shown in figure 19 are the results of the analysis for the construction NDT data. Again, the subgrade stiffness clearly increases with increasing structural capacity or rigidity. The reference location data shows a lower stiffness than the construction data, which is probably due to the substantial increase in subgrade moisture content from the as-constructed value of 10 percent to the equilibrium value of 17 percent. Equation 8 presents the estimated in-situ subgrade modulus as a function of structural capacity. Again, the structural capacity can be converted to rigidity using equation 5 from chapter 2.

$$\begin{aligned} E_{sg} &= 29{,}870(SN)-25{,}437 && \text{for } SN > 2.0 \\ E_{sg} &= 34{,}474 && \text{for } SN \leq 2.0 \end{aligned} \tag{8}$$

where

E_{sg} = subgrade modulus in kPa
SN = structural number
1 kPa = 0.14504 lb/in^2

It is important to emphasize that the NDT presented in figure 19 was conducted on undamaged sections of the pavement. During the conduct of the phase 1 accelerated pavement tests, no attempt was made to keep water from entering cracks which developed in the pavement surface. During the first phase of research it was observed that water infiltration through surface cracks accelerated the rate of damage in the pavement.

PAVEMENT PERFORMANCE

Each of the pavement tests in table 13 are briefly described below, and several summary plots of loading, environment, and pavement performance history are presented. The complete data base is presented in tabular form in appendix C through I.

The first phase of research included testing each lane with three different load levels. For lane 1, loads of 51.6, 62.7 and 73.0 kN (11,600, 14,100, and 16,400 lb) were used while loads of 73.0, 84.5, and 100.1 kN (16,400, 19,000, and 22,500 lb) were used on lane 2. The tire pressure for each test was 689 kPa (100 lb/in^2) except lane 2, section 2 which was tested at 965 kPa (140 lb/in^2) as part of the tire pressure experiment. Due to time constraints, no replicate tests were conducted, and no attempt was made to minimize the effect of environment. Each test in the data base represents a valid observation of pavement performance for the loading and environmental conditions encountered, and should, therefore, be useful for the validation of mechanistic pavement performance models.

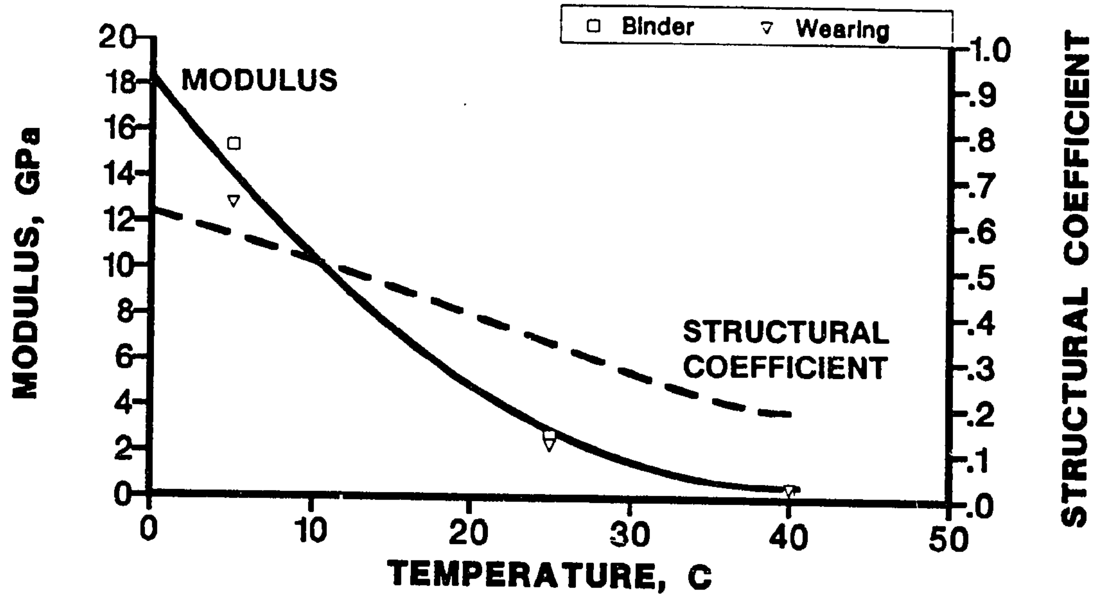


Figure 18. Asphalt concrete moduli and structural coefficients.

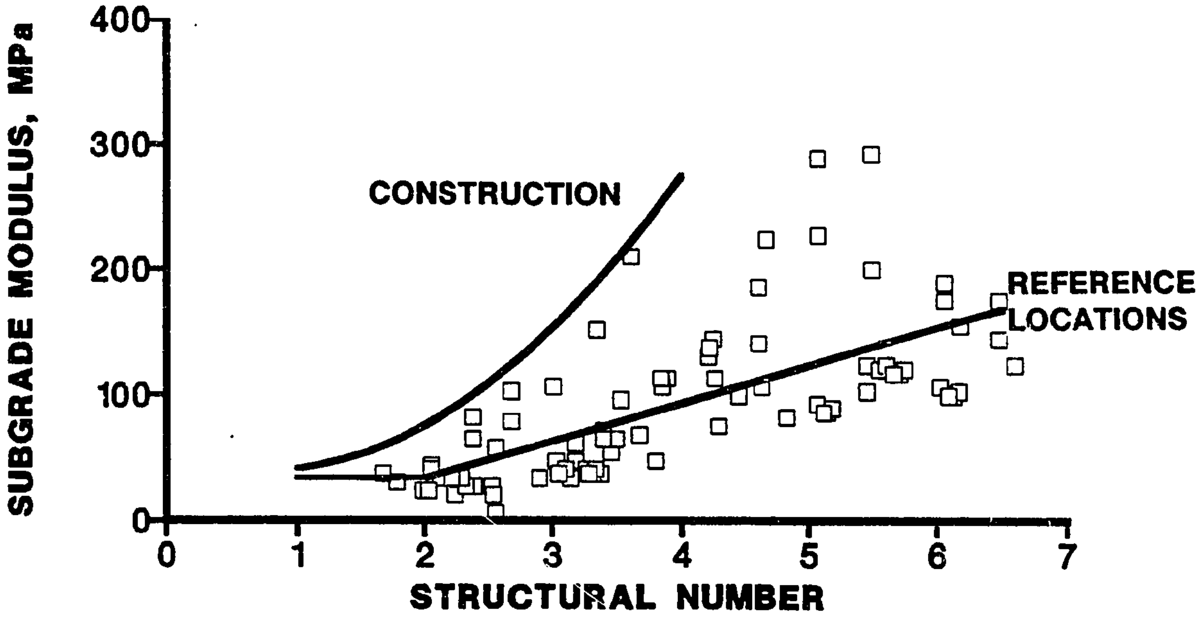


Figure 19. Estimated subgrade moduli.

Loading

The loading and temperature histories for each of the phase 1 pavement performance tests are presented in figures 20 and 21. Lane 2, section 3 was the first accelerated pavement test conducted after the initial ALF shakedown testing on lane 1, section 3. The test was conducted from January 8, 1987 to June 4, 1987. The planned load level and tire pressure were 84.5 kN (19,000 lb) and 689 kPa (100 lb/in^2), respectively, but some initial load repetitions were applied using a load of 51.6 kN (11,600 lb). Approximately 5.8 percent of the 502,662 load repetitions were applied using the 51.6 kN (11,600 lb) load. Pavement temperatures were not recorded for this test. Upon completion of the Lane 2, Section 3 test, the ALF was moved longitudinally to Lane 2, Section 2. During the Phase 1 research, two 578 kN (65 ton) cranes working together were used to move the ALF longitudinally between test sections within a given lane. Each move required approximately 2 to 4 hours depending on the distance moved.

Lane 2, section 2 was tested from June 18, 1987 to November 30, 1987. The planned load level and tire pressure were 84.5 kN (19,000 lb) and 965 kPa (140 lb/in^2), respectively, but some load repetitions were applied at other load levels and tire pressures as part of the tire pressure experiment. Less than 3 percent of the 578,142 load repetitions were applied at loads other than 84.5 kN (19,000 lb). The performance data for lane 2, sections 2 and 3 were analyzed to determine the effects of increased tire pressure on flexible pavement damage. Reference 9 presents details of this analysis. The ALF was then moved to lane 1, section 2. Cranes were not needed to move the ALF transversely from lane to lane. The linear actuators which provide the lateral movement to simulate traffic wander were used to move the machine between lanes.

The three performance tests in lane 1 were conducted sequentially from December 14, 1987 through April 4, 1988. Lane 1, section 2 was the first section tested. The test was conducted from December 14, 1987 through February 18, 1988. This was the first test which used the semiautomatic profiling device for measuring rutting and roughness. The planned load level and tire pressure for this test were 51.6 kN (11,600 lb) and 689 kPa (100 lb/in^2), respectively, but some load repetitions were applied at other load levels and tire pressures as part of the tire pressure experiment. Less than 2 percent of the 147,696 load repetitions were applied at loads other than 51.6 kN (11,600 lb). The ALF was then moved to lane 1, section 4. This section was tested from March 1, 1988 to March 8, 1988 using a load of 73.0 kN (16,400 lb) and 689 kPa (100 lb/in^2) tire pressure. Lane 1, section 4 failed after only 1 day of testing. Lane 1, section 1 was the last Lane 1 section tested. This section was tested from March 24, 1988 to April 4, 1988 using a load of 62.7 kN (14,100 lb) and 689 kPa (100 lb/in^2) tire pressure.

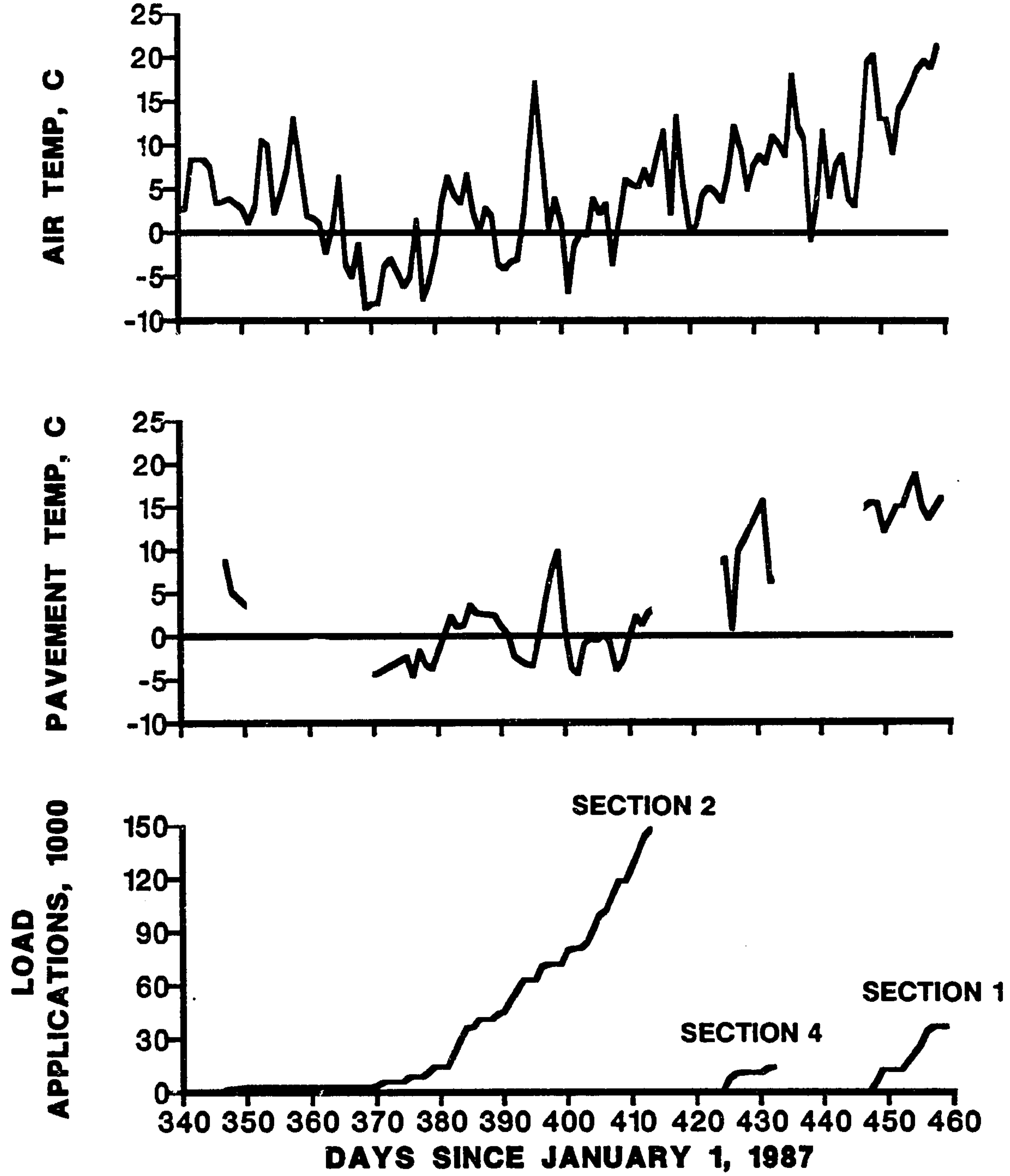


Figure 20. Loading and temperature histories for the lane 1 performance tests.

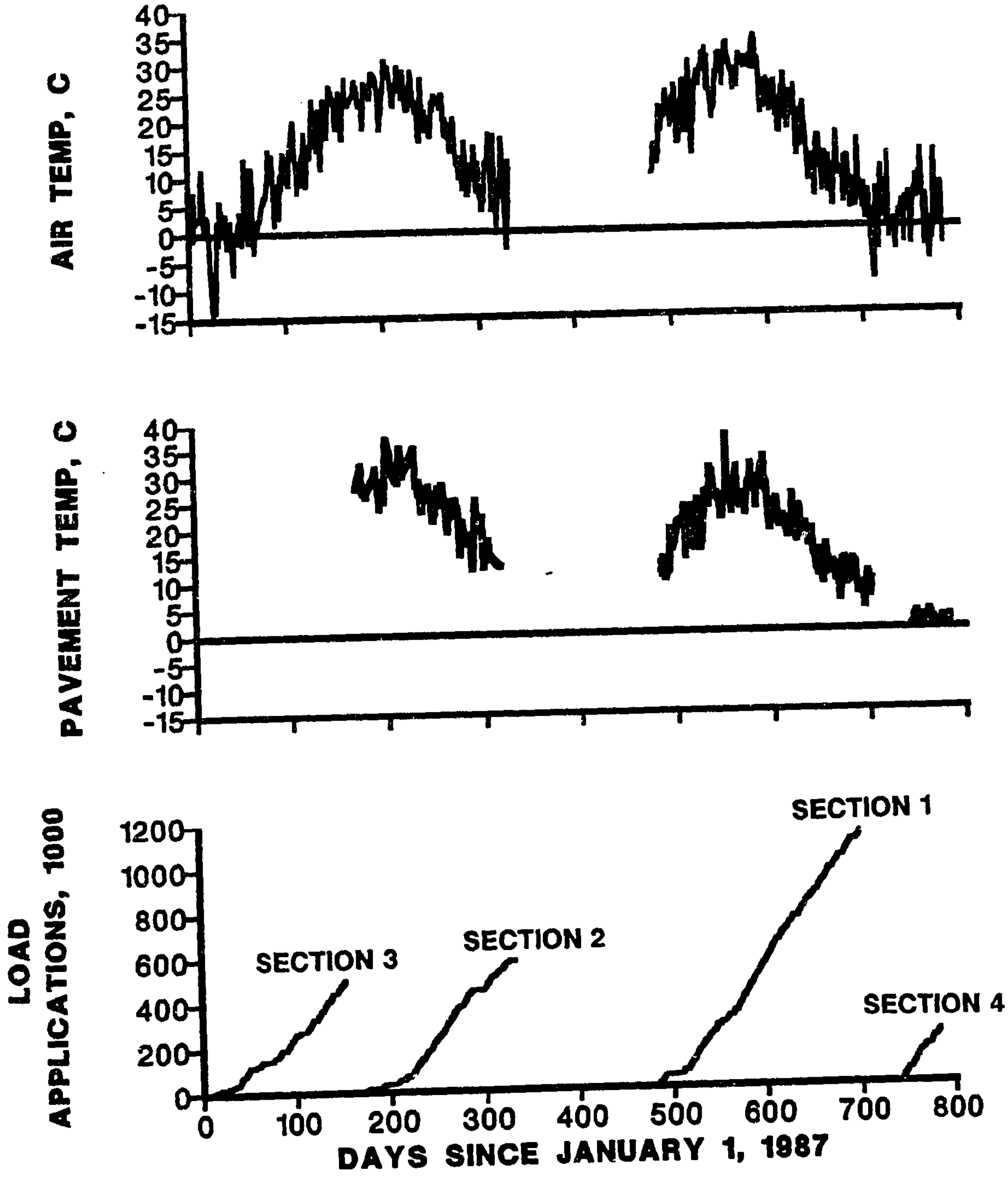


Figure 21. Loading and temperature histories for the lane 2 performance tests.

Upon completion of the lane 1 tests, the ALF was moved to lane 2, section 1. This section was tested from March 29, 1988 to December 12, 1988 using a load of 73.0 kN (16,400 lb) and 689 kPa (100 lb/in^2) tire pressure. Over 1.1 million load repetitions were applied to lane 2, section 1 during the testing period. The ALF was then moved to the final test section, lane 2, section 4. This section was tested from January 9, 1989 to February 23, 1989 using a load of 100.1 kN (22,500 lb) and 689 kPa (100 lb/in^2) tire pressure.

Rutting, Cracking, Present Serviceability Index

Figures 22 and 23 summarize the rutting, cracking, and PSI loss data for the lane 1 and 2 test sections, respectively. These figures represent average rutting and cracking and were obtained by averaging the data from the eight data collection subsections shown in figure 11. For most of the phase 1 tests, the pavement damage was highly variable along the test section as shown in figures 24 and 25. Three factors contributed to the variability in damage along the test section.

The first factor was spacial variations in the thickness and properties of the pavement materials and subgrade soil. During the first phase of research, no special precautions were taken to reduce construction variability. The tolerances specified in the Virginia Department of Highways and Transportation specifications governed the phase 1 pavement construction.(1) Typical highway construction variability condensed into a short test section can have a large influence on the performance of the pavement within the test section.

Second, the performance of lane 2, section 3 and lane 2, section 4, was influenced by previous coring within the ALF wheelpath. For a research project concerning the in-situ measurement of asphalt concrete density, several 102 mm (4 in) diameter cores were removed from random locations within the PTF shortly after construction. The cores were taken before the ALF test sections were laid out and, due to the limited space available, the test section locations could not be adjusted to avoid having core sample locations in these two sections. The core locations were at Station 39.0 m (128 ft) in lane 2, section 3, and Station 49.7 m (163 ft) in lane 2, section 4. Although the core holes were filled with compacted cold-mix asphalt concrete patching material, increased rutting and cracking were observed in the vicinity of the core sample locations in both test sections.

The final factor affecting the distribution of damage within the test sections was the dynamic loading of the ALF. Recall from figure 10, the ALF applied a significant dynamic loading component, particularly at the lighter load levels. Due to this dynamic effect, the loading for the first 1.22 m (4 ft) of the test section could be 14 kN (3150 lb) lighter than the static weight, while the loading for the second 1.22 m (4 ft) section could be 10 kN (2250 lb) heavier than the static weight. Except at the 41.8 kN (9,400 lb) load level, the dynamic effect dampened out by the third 1.22 m (4 ft) section.

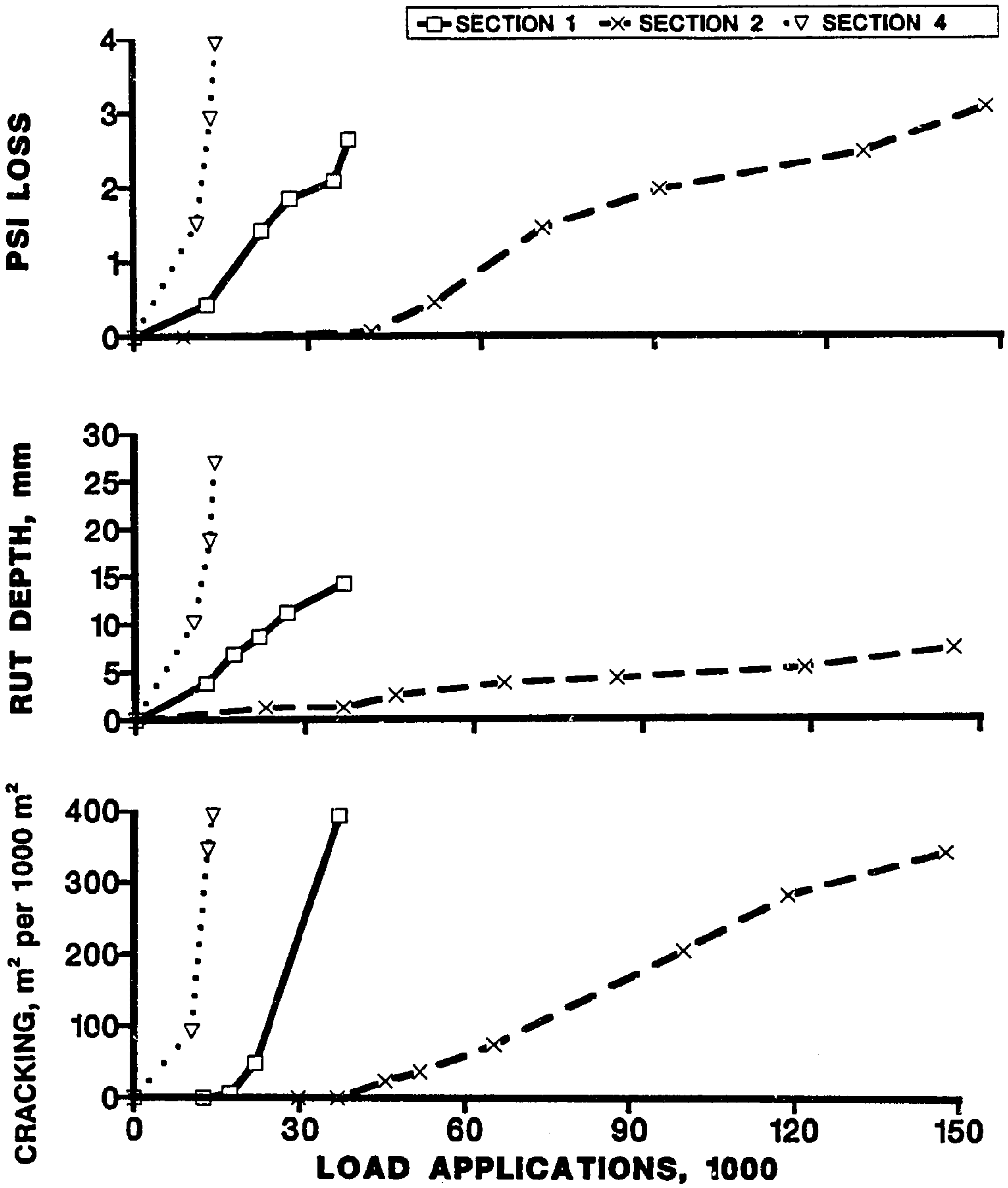


Figure 22. Summary of lane 1 pavement performance.

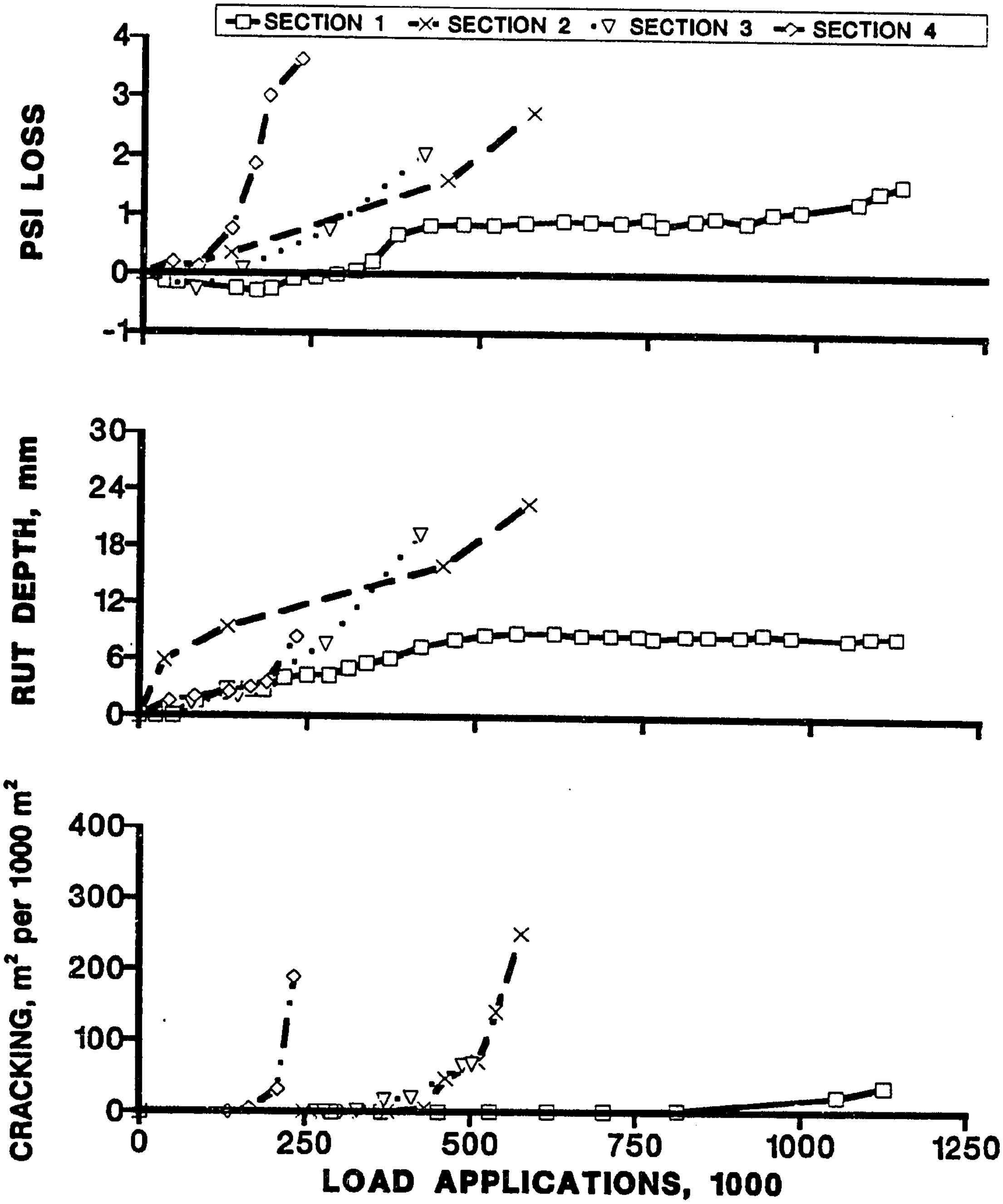


Figure 23. Summary of lane 2 pavement performance.

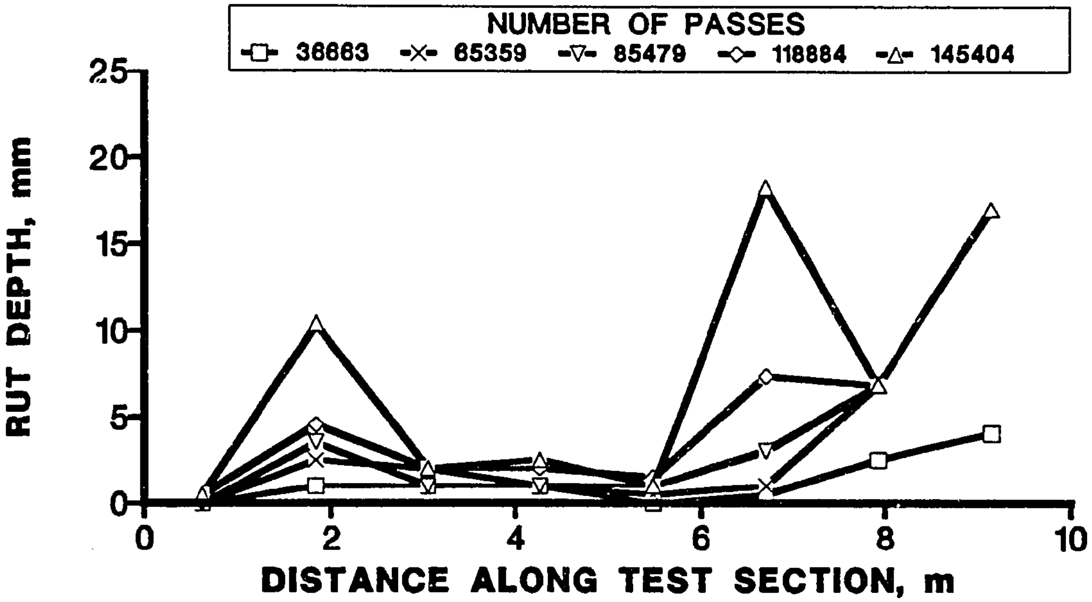


Figure 24. Distribution of rutting within lane 1, section 2.

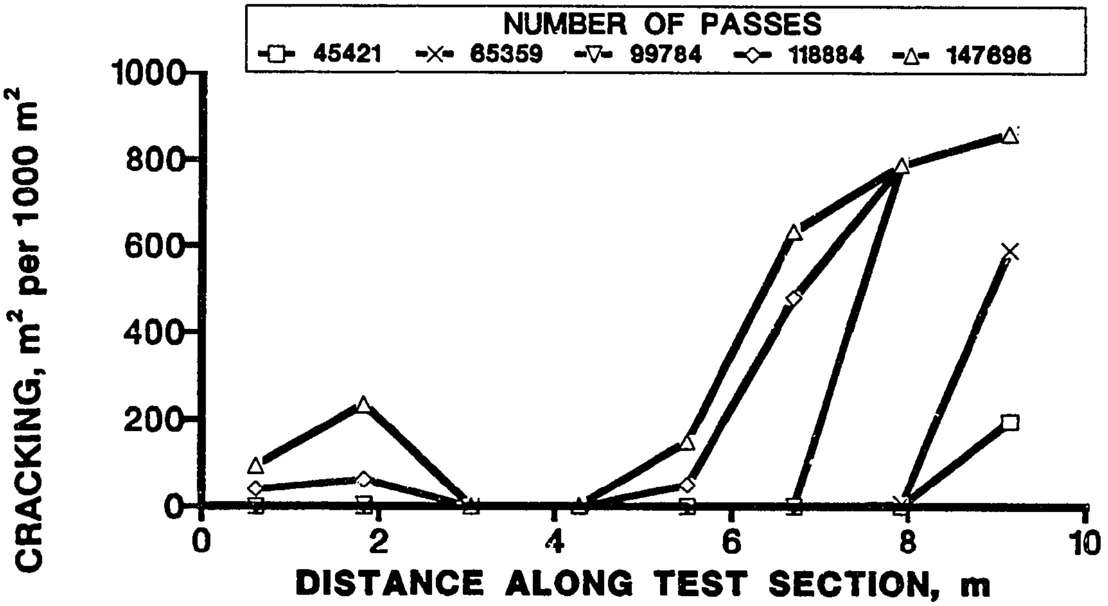


Figure 25. Distribution of cracking within lane 1, section 2.

Figures 24 and 25 show the effect of the dynamic loading on pavement damage. The rutting and cracking in the first data collection subsection are significantly lower and the data in the second subsection are significantly higher than the remainder of the test section.

The average pavement performance data shown in figures 22 and 23 follow the general trends observed through monitoring of various test roads and inservice pavement sections. The rapid deterioration of the pavement after fatigue crack initiation was clearly evident in all of the test sections. For all test sections, the fatigue cracks initiated transverse to the direction of travel of the ALF. After repeated load applications, longitudinal and additional transverse cracks appeared, resulting in the block or alligator cracking typical of fatigue failure.

The damaging effect of increasing load level is clearly evident in the cracking and PSI loss data. Table 14 summarizes the number of load applications required to reach average wheelpath cracking of 5 percent and PSI loss of 2.0. To obtain the percent wheelpath cracking, the cracking data in figures 22 and 23 were multiplied by 1.4, the ratio of the width of the ALF wheelpath to the 1.83 m (6 ft) width used as a basis in the collection of the cracking data. The data in table 14 were then used to develop damage relationships smiliar to the fourth power law established at the AASHO Road Test. Table 15 presents load and damage ratios calculated from the data of table 14. Regression analyses on these data indicated a power relationship with an exponent of

Table 14. Load applications to 5 percent wheelpath cracking and 2.0 PSI loss.

			LOAD APPLICATIONS	
LANE	SECTION	LOAD, kN	5% CRACKING	2.0 PSI LOSS
1	1	62.7	21,600	31,200
1	2	51.6	54,000	92,400
1	4	73.0	6,000	12,000
2	1	73.0	1,150,000	1,230,000[1]
2	2	84.5	455,000	500,000
2	3	84.5	445,000	420,000
2	4	100.1	210,000	170,000

[1] Extrapolated

1 kN = 224.809 lb

Table 15. Damage ratios for phase 1 performance tests.

		DAMAGE RATIO	
LANE	LOAD RATIO	CRACKING	PSI LOSS
1	1.16	3.60	2.60
1	1.22	2.50	2.96
1	1.41	9.00	7.70
2	1.16	2.53	2.46
2	1.16	2.58	2.93
2	1.18	2.17	2.94
2	1.18	2.12	2.47
2	1.37	5.48	7.23

approximately 6.0 provided a reasonable fit to the data. Separate regression analyses for cracking and PSI loss yielded exponents of 5.8 and 6.1, respectively. Figure 26 presents a comparison of the damage relationship developed from the phase 1 data with the fourth power law. From this comparison, it is apparent that load had a significantly greater effect on the performance of the phase 1 test sections than would be predicted by the fourth power law. This finding can not be entirely attributed to the slow speed and continuous loading of the ALF machine. Other factors including the nonlinear, stress softening behavior of the PTF subgrade soil, differences in environmental conditions during testing of each section, and between section variability in layer thicknesses, and material properties must also be considered as potential causes of the higher damage exponent derived from the phase 1 PTF tests.

The phase 1 rutting data show the effects of temperature and cracking on the permanent deformation behavior of the test sections. For three of the lane 2 sections (section 1, section 3, and section 4) traffic loading began during relatively cool weather conditions. For these sections, the observed rutting early in the pavement life was small and was very similar in spite of the different load level used on each section. On the other hand, traffic loading for section 2 of lane 2 began during relatively hot weather conditions. This test section exhibited a large amount of early rutting. Finally, section 2 of lane 1 and sections 2 and 4 of lane 2 showed a significant increase in the rate of rutting after the initiation of fatigue cracking in the pavement. Increasing temperatures appear to have masked this effect in section 3 of lane 2, while little cracking was observed in lane 2, section 1. Sections 1 and 4 of lane 1 cracked so quickly that initial rutting data were not collected.

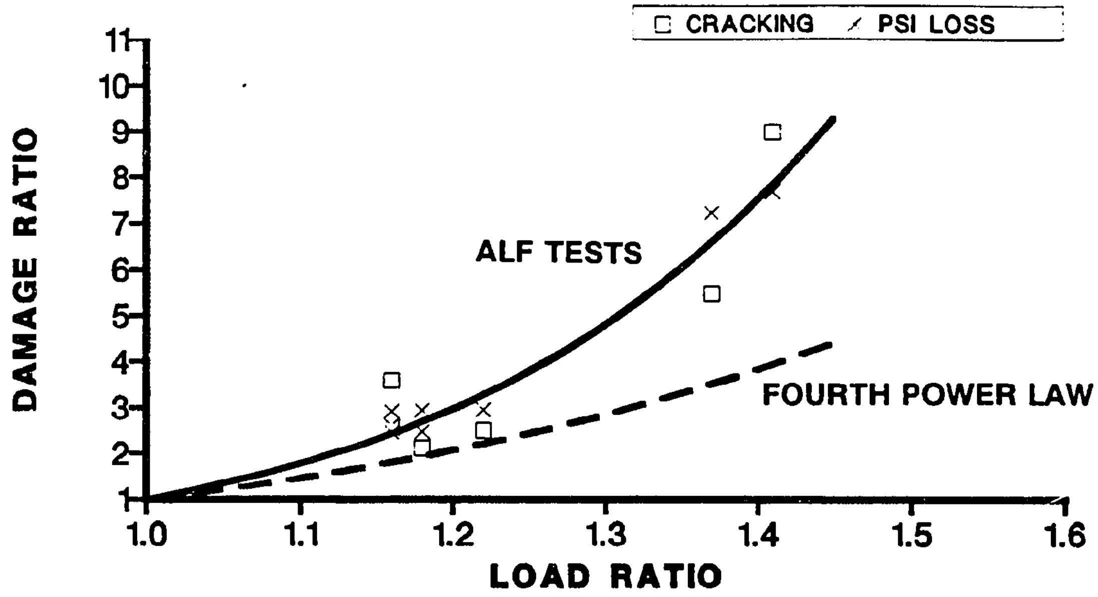


Figure 26. Phase 1 load damage relationship.

NDT and Pavement Responses

NDT was performed periodically with a falling weight deflectometer during each of the Phase 1 accelerated load tests. NDT data were collected at selected locations, both in and out of the wheelpath, prior to trafficking the test section and at three to five times during the testing period. The raw NDT data are presented with the pavement performance data in appendixes C through I. Planned analyses included the backcalculation of moduli for each pavement layer. The nonlinear subgrade behavior described previously, however, resulted in unrealistic layer moduli when layered elastic basin analysis methods were used. The subgrade typically converged to moduli in the 68.9 to 103.4 kPa (10,000 to 15,000 lb/in^2) range, while the crushed aggregate base generally converged to lower moduli. These results were inconsistent with the laboratory data and observations concerning the consistency of the materials during the post failure evaluations; therefore, no backcalculated layer properties were presented in this report. Backcalculations assuming nonlinear material behavior were beyond the scope of the phase 1 research effort.

The development of structural distress in the test sections was, however, tracked using AASHTO NTD Method 2. Recall for NDT Method 2, the deflection at the middle of the load plate was related to the subgrade modulus and the structural number through equation 4 in chapter 2. Since the PTF subgrade was nonlinear, the subgrade modulus as a function of structural capacity was estimated using equation 8 which was developed from NDT tests at the untrafficked reference locations. Thus, the effective structural number was obtained by simultaneous solution of equations 4 and 8. By performing this analysis on data from both in and out of the wheelpath, the structural condition factor, C_{xeff}, could be estimated.

$$C_{xeff}=\frac{SN_x}{SN_o}\approx\frac{SN_{xwp}}{SN_{xout}} \qquad (9)$$

where

C_{xeff} = structural condition factor
SN_{xeff} = effective structural number after traffic x
SN_o = initial structural number
SN_{xwp} = effective structural number after traffic x in wheelpath
SN_{xout} = effective structural number after traffic x out of wheelpath

Figures 27 and 28 present the structural condition factor as a function of traffic loading for the tests on lanes 1 and 2, respectively. As expected, the three tests on the lane 1 sections and two of the lane 2 tests (sections 2 and 4) show a significant decrease in the structural condition factor with traffic loading. The condition factor for these tests reached a value of approximately 0.6 when traffic was stopped. Thus, at the end of trafficking, these test sections had approximately 60 percent of their original structural capacity remaining. Two of the lane 2 sections (section 1 and section 3), however, showed little decrease in the structural condition factor as a result of the traffic loading. Referring to the cracking data in figure 23, these two sections exhibited significantly less surface cracking. Figure 29 presents the relationship between structural condition factor and observed surface cracking (AASHTO Type 2 and 3) developed from the seven phase 1 tests. This figure shows the structural condition factor can reach a value of approximately 0.8 prior to the development of significant wheel path cracking.

A similar finding was made using measured strains from the strain gauges installed at the bottom of the asphalt layer. Several of the "H" type strain gauges installed in lane 2, section 3 remained operational throughout most of the testing period. Additionally, strain gauges that were retrofitted by bonding gauges to cores and epoxying the cores in the pavement remained operational in lane 2, section 1 for over 1,000,000 load repetitions. Figure 30 present plots of the measured strain at the bottom of the asphalt layer as a function of the number of load repetitions. The influence of pavement temperature during the testing period is clearly evident in this data. For the lane 2, section 3 test, the pavement temperature increased throughout the testing period. For lane 2, section 1, the temperature increased then decreased.

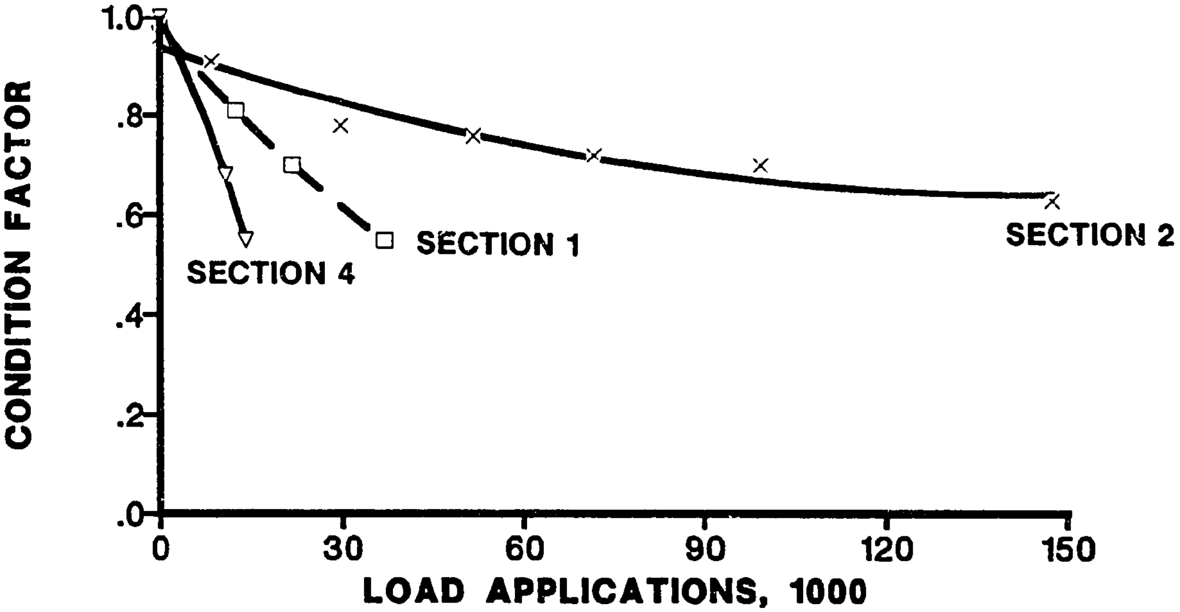


Figure 27. Structural condition factor for lane 1 tests.

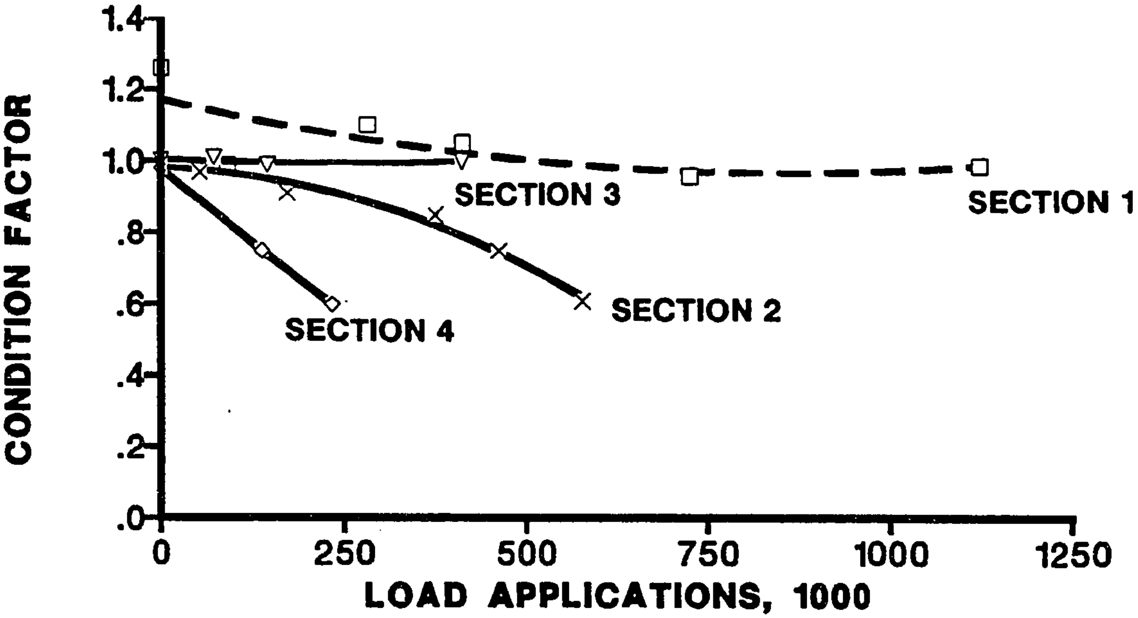


Figure 28. Structural condition factor for lane 2 tests.

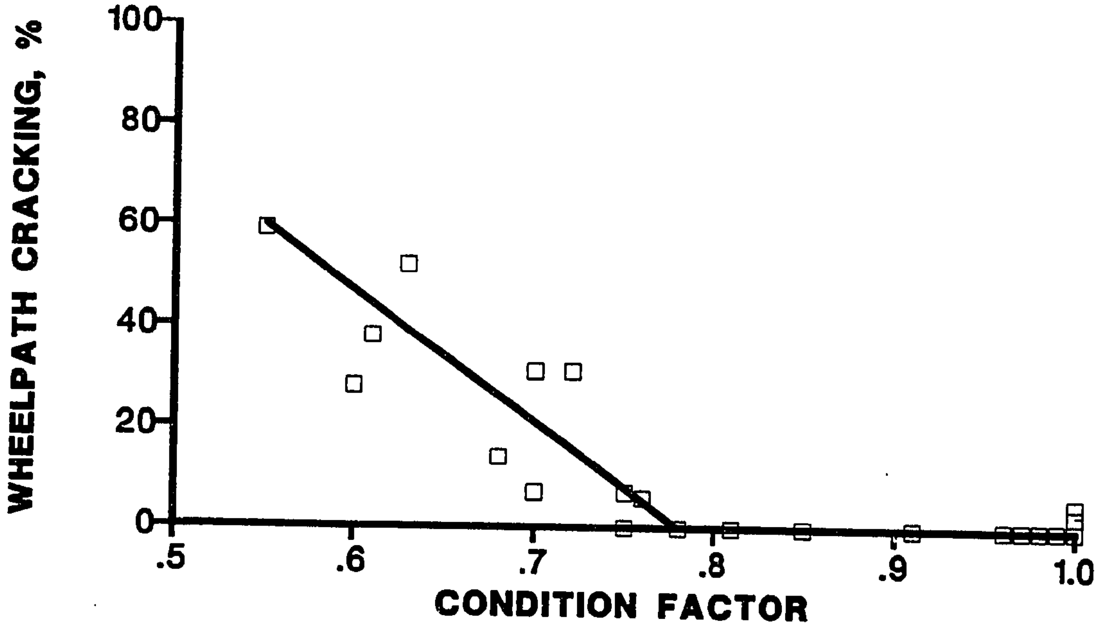


Figure 29. Cracking versus structural condition factor, phase 1 tests.

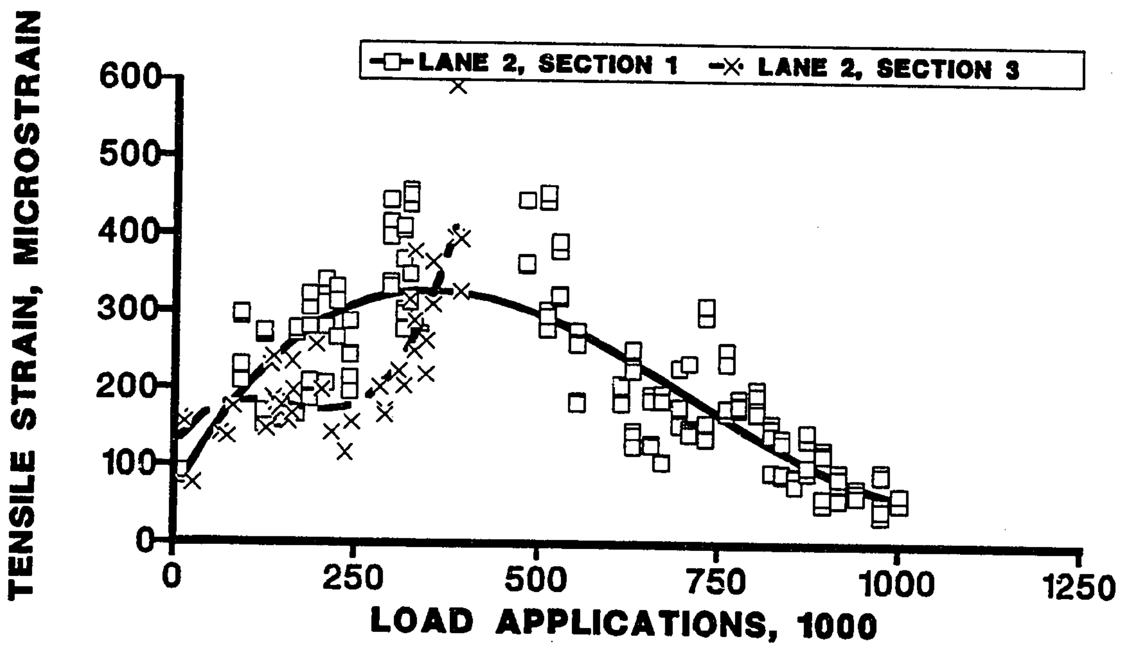


Figure 30. Measured strains for lane 2, section 3 and lane 2, section 1.

In an attempt to analyze the strain data to determine the magnitude of the fatigue damage in the asphalt layer, the measured strains were compared to strains predicted from layered elastic analysis. To account for the variation in pavement temperature, and the nonlinear subgrade behavior, pavement temperatures measured during the collection of the strain data were used to estimate asphalt concrete moduli and layer coefficients from figure 19. These layer coefficients were used with measured pavement thicknesses to determine the structural number and to estimate the subgrade modulus from equation 8. Strains corresponding to these moduli were then calculated from layered elastic theory using the corresponding ALF wheel loading and an average base course modulus of 206.8 kPa (30,000 lb/in^2). The difference between the measured and predicted strains can be attributed to damage in the asphalt layer.

Figures 31 and 32 present the ratio of the measured to predicted strains as a function of load repetitions. No distinct trend is apparent in the lane 2, section 3 data; however, for the lane 2, section 1 data, there is a definite decrease in the strain ratio after approximately 800,000 load cycles. This decrease implies the development of cracks outside the active area of the strain gauges. An increase in strain ratio would be expected if the cracks occurred within the active area of the gauges. This concept is shown schematically in figure 33. Case 2 of figure 33 shows the development of a single crack within the active area, and case 3 shows the development of cracks outside the active area. For case 2 the measured strains would increase over those for the intact pavement (case 1), while for case 3, the measured strains would decrease. Since the active area of the gauge is small compared to the pavement, case 3 would most likely occur. Thus, from the strain data, cracks occurred in the vicinity of the strain gauges in lane 2, section 1 after approximately 800,000 load repetitions, while no cracks occurred in lane 2, section 3 through approximately 400,000 load repetitions. Referring to figure 23, significant surface cracking for these two pavements occurred after 1,000,000 and 500,000 repetitions, respectively

Postfailure Investigations

After each of the phase 1 test sections failed, a postfailure investigation was conducted to document the condition of each pavement layer. Figures 34 and 35 present layer profiles obtained during the post failure investigations. For the lane 2 tests, no rutting was observed in the subgrade; therefore, only the profiles of the pavement surface and the surface of the crushed aggregate base are shown in figure 35. For most of the phase 1 tests, the majority of the rutting occurred in the crushed aggregate base layer. Rutting in the subgrade was only observed for tests using heavy loads on the thin pavement structure of lane 1. Permanent deformation in the asphalt layer was small for all tests. Even lane 2, section 1 and lane 2, section 2, which were tested primarily during hot weather, exhibited less than 10 mm (0.39 in) of rutting in the asphalt concrete.

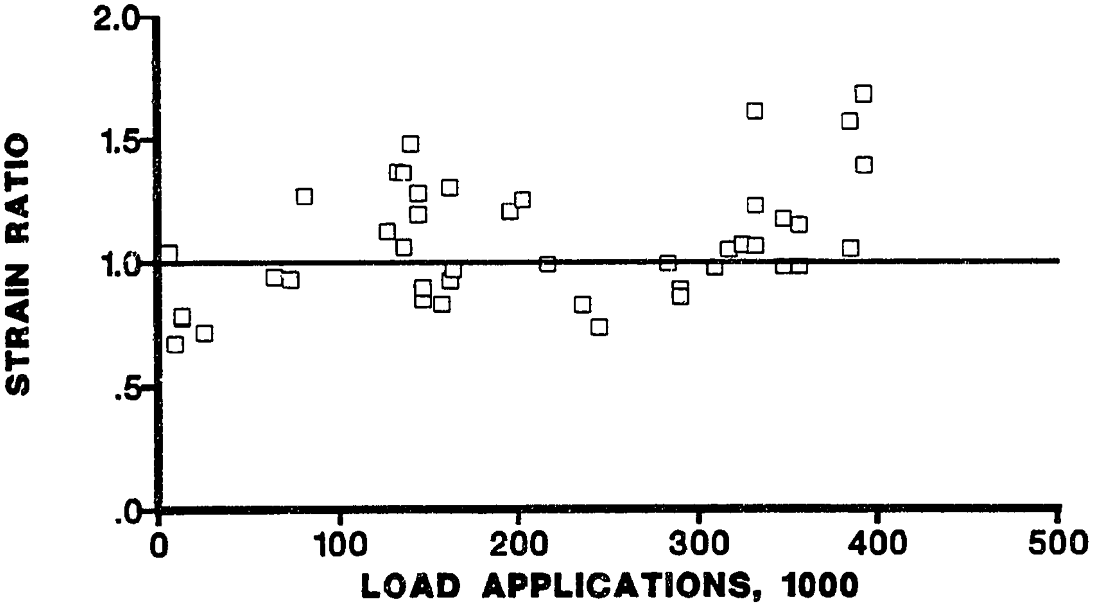


Figure 31. Ratio of measured to predicted strains for lane 2, section 3.

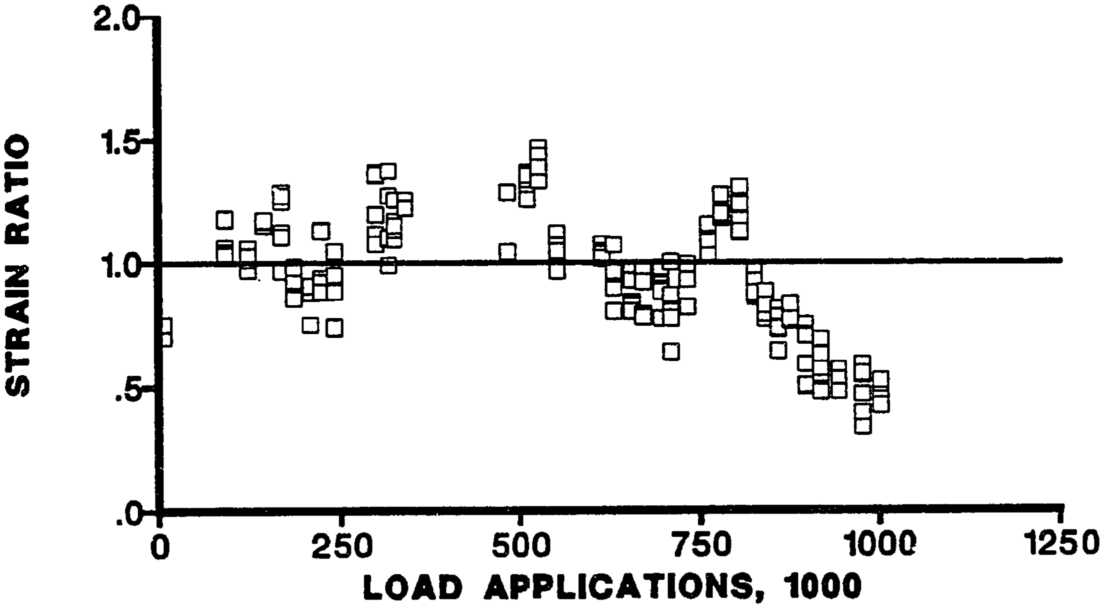
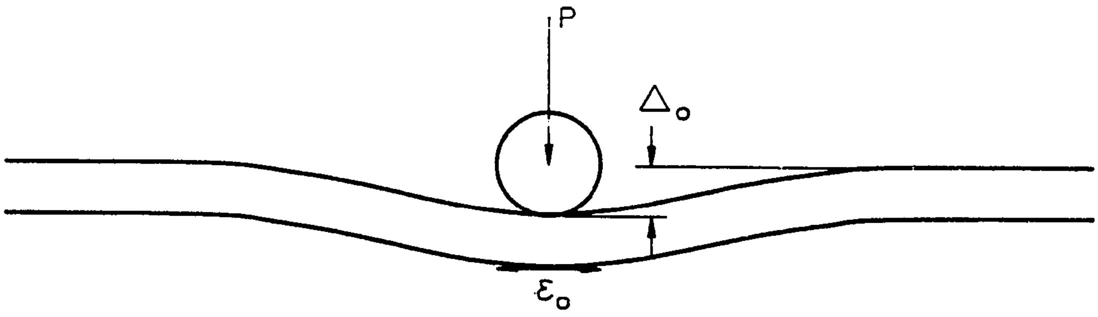
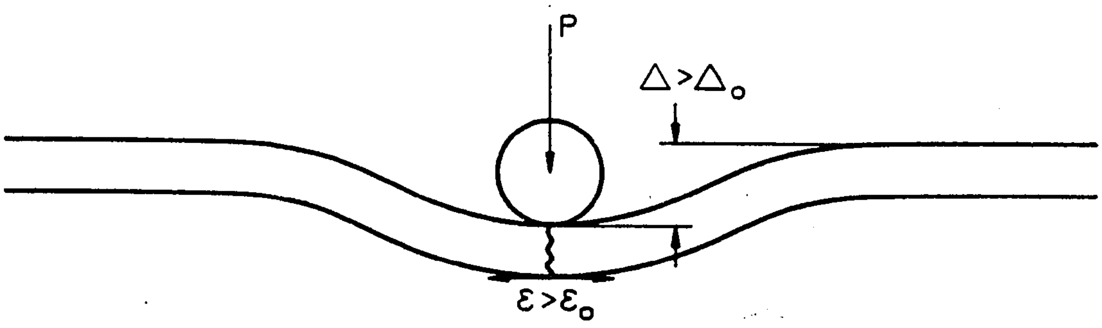


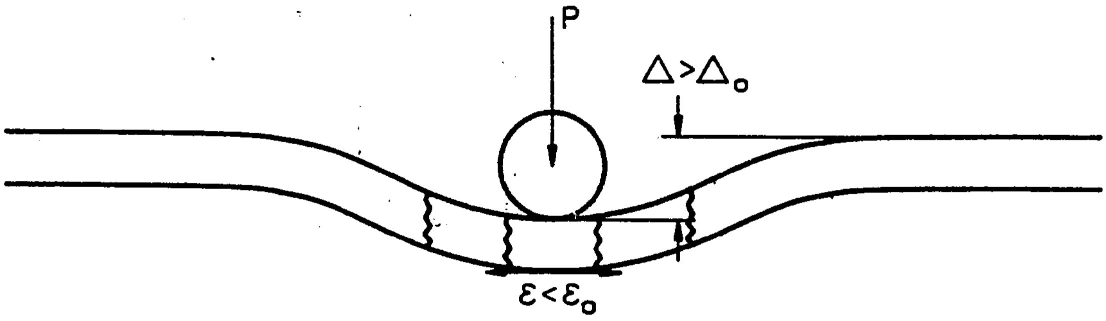
Figure 32. Ratio of measured to predicted strains for lane 2, section 1.



Case a. Uncracked pavement.



Case b. Single crack within active area of gauge.



Case c. Multiple cracks outside active area of gauge.

Figure 33. Schematic of measured strains and crack location.

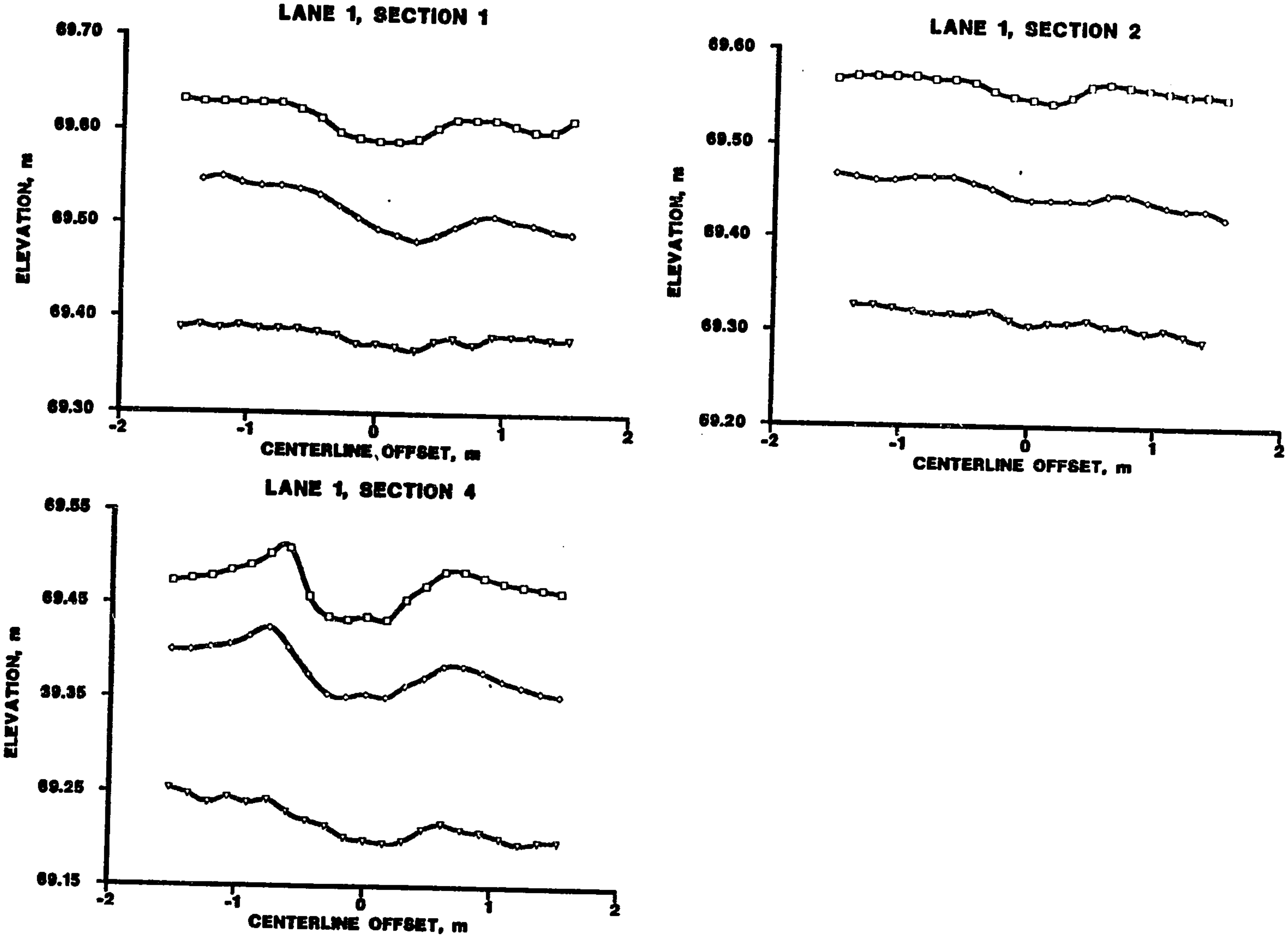


Figure 34. Postfailure profiles for lane 1.

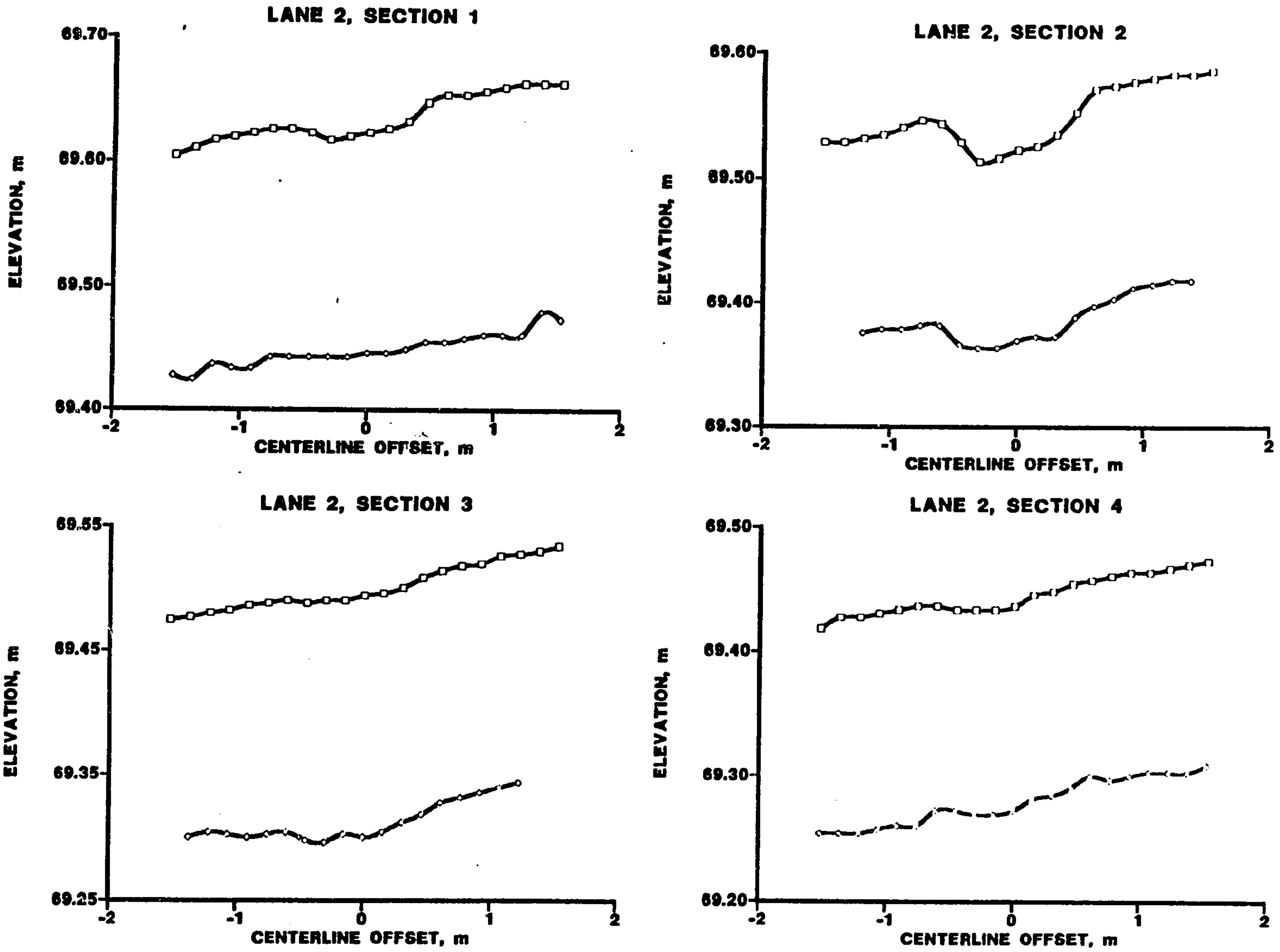


Figure 35. Postfailure profiles for lane 2.

Tables 16 and 17 summarize the moisture content and density of the base and subgrade soil measured during the post failure investigations. The nuclear density equipment used during the postfailure investigations was not operating properly for the investigations on sections 2 and 3 of lane 2; therefore, no density data were reported for these tests. Additionally, the density data from construction appear suspect as they are significantly higher and have greater scatter compared to the post failure data. The density data in table 16 show densification in the crushed aggregate base to be a cause of the rutting in this layer of the pavement. At the representative density of 2303 kg/m^3 (143.8 lb/ft^3), the crushed aggregate base layer was compacted to only 94 percent of AASHTO T-180 maximum dry density. Densification under heavy traffic loads should be expected for this level of compaction. The crushed aggregate base used in the phase 1 test was approximately 50 to 70 percent saturated at the in-situ density and moisture content. Previous research concerning the response of granular materials to repeated loads, showed a critical saturation level of 85 to 90 percent above which large permanent deformation should be expected.(12) The moisture contents from the post failure investigations confirm the conclusions from the moisture cells concerning the subgrade moisture content during the phase 1 tests. The subgrade moisture content increased from the as constructed value of 10 percent to approximately 17 percent prior to trafficking the test sections. During this same period the base course moisture content increased from 3.2 to 5.4 percent. Both the subgrade and the base course moisture contents then remained relatively constant throughout the testing period.

The air void contents of cores taken both in and out of the wheelpath during the post failure investigations are summarized in table 18. These data show a large between test section variation in air void content, particularly for the binder layer. Comparing the in versus out of wheelpath air voids indicates very little densification occurred in the wearing course of most of the test sections. In fact, the binder voids suggests dilation under traffic loading as several of the sections have wheel path voids which are greater than the out of wheel path voids. Plastic heave in the asphalt layer was only observed in lane 2, section 1. Figure 36, presents typical transverse profiles obtained with the semiautomatic profiling device at various times during the testing of lane 2, section 1. Note the dual tire tracks and the plastic heave outside the wheelpath. All of the rutting shown in this figure occurred in the asphalt concrete. From table 18, the air void content of the asphalt concrete in this test section was extremely low, 2.63 percent for the wearing course and 1.82 percent for the upper lift of binder.

SUMMARY

This chapter summarizes the results of the phase 1 accelerated pavement performance tests. Sections in each lane were tested with three different load levels. Loads of 51.6, 62.7, and 73.0 kN (11,600, 14,100, and 16,400 lb) were used for lane 1, while lane 2 was tested with loads of 73.0, 84.5, and 100.1 kN (16,400, 19,000, and

Table 16. Postfailure base course density and moisture contents.

	Statistic	Dry Density, pcf		Moisture, %	
As-built	Avg	2550		3.18	
	σ	104.6		0.26	
Section	**Statistic**	**In**	**Out**	**In**	**Out**
L1S1	Avg	2382	2364	5.5	5.3
	σ	43.4	46.4	0.60	0.41
L1S2	Avg	2294	2250	5.2	5.5
	σ	56.8	74.6	0.25	0.23
L1S4	Avg	2271	2207	5.5	5.6
	σ	56.0	90.0	0.43	0.29
L2S1	Avg	2279	2250	4.7	5.0
	σ	23.5	59.7	0.10	0.46
L2S2	Avg				
	σ				
L2S3	Avg				
	σ				
L2S4	Avg	2318	2283	5.6	5.6
	σ	51.1	34.9	0.36	0.15

1 kg/m^3 = 0.0624280 lb/ft^3

Table 17. Postfailure subgrade density and moisture contents.

	Statistic	Dry Density, kg/m^3		Moisture, %	
As-built	Avg	1925		10.0	
	σ	66.6		1.37	
Section	**Statistic**	**In**	**Out**	**In**	**Out**
L1S1	Avg	1791	1820	14.9	15.0
	σ	52.2	71.8	0.50	2.05
L1S2	Avg	1700	1706	16.6	16.4
	σ	34.9	28.4	0.83	0.88
L1S4	Avg	1765	1728	15.5	16.4
	σ	49.5	44.0	0.85	0.98
L2S1	Avg	1807	1781	17.9	19.1
	σ	42.1	28.2	0.52	1.71
L2S2	Avg				
	σ				
L2S3	Avg				
	σ				
L2S4	Avg	1818	1821	16.6	16.4
	σ	37.8	34.1	0.62	1.61

1 kg/m^3 = 0.0624280 lb/ft^3

Table 18. Postfailure asphalt concrete air void contents.

		AIR VOID CONTENT, %					
		Wearing		Upper Binder		Lower Binder	
Section	Statistic	In	Out	In	Out	In	Out
L1S1	Avg σ	4.77 0.58	4.24 0.67	4.63 0.96	3.34 0.71		
L1S2	Avg σ	4.84 0.67	4.85 0.50	3.10 0.96	2.64 1.14		
L1S4	Avg σ	5.10 0.66	4.46 0.81	4.63 1.03	4.34 1.06		
L2S1	Avg σ	2.70 0.64	2.63 0.95	1.63 0.63	1.82 0.70	3.08 0.96	3.12 0.95
L2S2	Avg σ	4.28 0.21	5.63 0.55	5.76 0.94	7.59 1.22	2.91 0.32	4.22 0.76
L2S3	Avg σ	3.39 0.24	4.07 0.51	3.23 1.17	1.60 0.38	2.83 0.53	3.30 0.53
L2S4	Avg σ	5.42 1.48	5.95 0.72	3.62 1.30	4.07 0.97	3.55 1.18	5.02 1.19

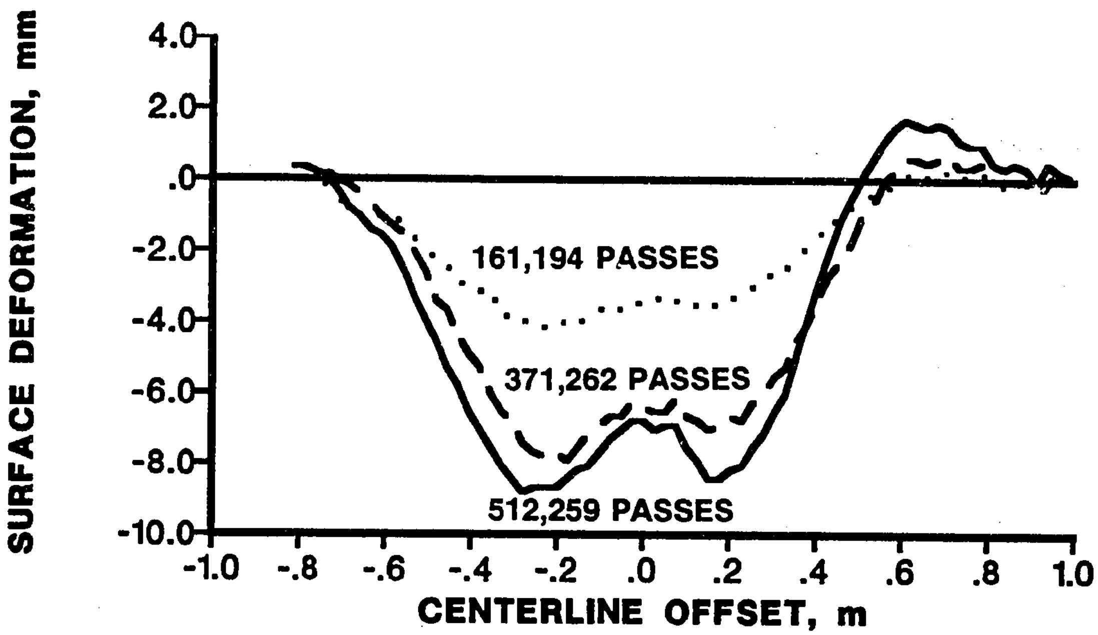


Figure 36. Typical lane 2, section 1 transverse profiles.

22,500 lb). Rutting, cracking, PSI, NDT, and pavement strain data were used to monitor the performance of the test pavements as a function of the number of load applications. The performance histories followed the general trends observed through the monitoring of various test roads and inservice pavement sections. The NDT and pavement strain data indicated a significant loss of structural capacity occurred prior to the development of cracks at the pavement surface. Fatigue failure was the predominant failure mode for the phase 1 test sections. Excessive rutting in the test sections did not develop until after the asphalt concrete was severely cracked. Post failure tests conducted on each section showed the majority of the rutting occurred in the crushed aggregate base layer. Rutting in the asphalt layer was small in all test sections, including lane 2, section 1 which exhibited rutting only in the asphalt concrete.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

Overall, the first phase of research at the PTF was very successful. Each of the phase I research objectives were met, and considerable operation, data collection, and data analysis experience were gained. This experience lead to the development of recommendations to enhance the capabilities of the ALF and the PTF for future research projects. Specific phase I conclusions and recommendations are discussed below.

CONCLUSIONS

A major portion of the phase I research effort was devoted to the development of routine operating and data collection procedures for the ALF and the PTF. Procedures for two modes of operation, response testing and accelerated loading, were established for the ALF. The response testing mode made use of the ALF's variable loading and lateral position capabilities, and the pavement instrumentation. Response testing formed a key element of the tire pressure study completed during the first phase of research.(9) The second mode of operation, accelerated testing, took advantage of the continuous operating capability of the ALF machine. During accelerated testing, the ALF was operated 24 hours per day, 7 days per week. Typical phase 1 productivity statistics for this mode of operation were 65 percent operating, 7 percent failure, and 28 percent standby based on 168 hours per week. This level of operating efficiency was attained by staffing the facility with two operators working a normal 40 hour work week. Additional operating time could be realized through additional staffing, particularly on weekends.

During the first phase of research, the ALF was operated in both the response and accelerated testing modes using its complete range of loads: 41.8 to 100.1 kN (9,400 to 22,500 lb). Based on observations and maintenance records during operation at each load level, an optimal load range of 51.6 to 84.5 kN (11,600 to 19,000 lb) was established. At loads lighter than the 51.6 kN (11,600 lb) level, the dynamic load induced when the ALF wheel assembly contacted the pavement did not quickly dampen. At the 100.1 kN (22,500 lb) load level, down time and component repair costs increased significantly. This optimal load range should be considered in the planning of future experiments.

Instrumentation, equipment, and procedures were also established during the first phase of research for routine data collection and analysis. Routine data included environmental (air and pavement temperature, precipitation, and subgrade moisture), pavement response (strains and deflections), and pavement performance (rutting, cracking, roughness, PSI, NDT, and postfailure investigation). A computer based data acquisition system and software were developed during the first phase of research for acquiring, analyzing, and storing pavement response and performance data.

An inexpensive "H" type strain gauge was developed to measure strains at the bottom of the asphalt concrete. Techniques for installing the gauge at the interface between the crushed aggregate base and the subgrade proved successful as all of the gauges were operational immediately after construction. The long-term durability of the gauges, however, was poor with most of the gauges failing within 1.5 years after construction. Many of the failures occurred prior to traffic loading and were the result of environment effects. Those gauges which survived the environmental effects generally failed early in the life of the pavement. Several strain gauges were retrofitted using a technique developed in Finland. This retrofit technique appears promising. In one test, the retrofit gauges remained operational for over 1,000,000 load repetitions. A semiautomatic surface profiler was also developed during the phase 1 research effort. Using this device accurate longitudinal and transverse profiles were quickly obtained at various times during the life of the pavement.

Perhaps the most important objective of the phase 1 research program was the assessment of the pavement performance and response data collected using the ALF pavement testing machine. The performance data assessment was mainly qualitative. This assessment was accomplished by comparing the general trends and failure modes obtained with the ALF to expected trends and failure modes based on previous test road, inservice pavement, and computer simulation experience. The ALF device accelerates pavement damage primarily through the use of extremely heavy loads. There was concern that these heavy loads operating at slow speeds would induce atypical failure modes in the test pavements. The results of the phase 1 research showed this to be a valid concern for the thin pavement structure of lane 1. Loads of 62.7 and 73.0 kN (14,100 and 16,400 lb) induced significant subgrade rutting in lane 1 while the 51.6 kN (11,600 lb) load did not. Expected performance was observed for the lane 2 tests through the maximum ALF load of 100.1 kN (22,500 lb). Overall, the pavement performance data collected with the ALF followed the general trends expected based on previous test road, inservice, and computer simulation experience. Fatigue cracking was the predominant failure mode. Excessive rutting in the subgrade was observed only for the thin pavement structure of lane 1 when trafficked with very heavy loads.

The effect of load on cracking and PSI loss was significantly greater than predicted by the fourth power law. For the phase 1 tests the damage exponent was approximately 6.0. This result can not be entirely attributed to the slow speed and continuous loading of the ALF machine. Other factors including the nonlinear, stress softening behavior of the subgrade soil, differences in environmental conditions during testing, and between section variability in layer thicknesses and material properties must also be considered as potential causes of this higher damage exponent.

A more quantitative assessment of the pavement response data was conducted as part of the phase 1 research effort. This assessment showed the measured strains and deflections were in general agreement with the results of layered elastic analyses.

In the layered analysis, an important consideration was the nonlinear, stress softening behavior of the PTF subgrade soil. The effective subgrade stiffness was shown to increase dramitically with the rigidity of the pavement. For modeling the PTF subgrade, moduli ranging from 34.5 to 68.9 kPa (5,000 to 10,000 lb/in^2) should be used for the thin pavement structure of lane 1, while a range of 68.9 to 137.9 kPa (10,000 to 20,000 lb/in^2) should be used for the thicker lane 2 pavement. For high pavement temperatures and heavy loads, values near the low end of these ranges should be selected. Values near the high end should be used with low pavement temperatures and lighter loads.

In spite of the nonlinear subgrade behavior, NDT data collected during the first phase of research provided an excellent method for tracking structural damage in the pavement. An analysis of the NDT data using AASHTO Method 2 showed the structural condition factor, C_{xeff}, reached a value as low as 0.80 before cracking appeared at the pavement surface. A reasonable correlation between the structural condition factor and the extent of pavement cracking was developed using all of the phase 1 NDT data. Average structural condition factors reached approximately 0.60 for test sections with high levels of cracking.

The tire pressure study conducted during the first phase of research made extensive use of the pavement strain data from early in the life of the test pavements. This study showed tire pressure was not a significant factor in the fatigue damage of the PTF test sections.(9) The pavement strain data, however, proved less successful for tracking fatigue damage during the accelerated load testing. Most of the gauges failed early in the pavement life, but for those that remained operational their ability to quantify the extent of damage in the asphalt layer depended on the location of the cracks relative to the strain gauge. If cracks occur outside the active area of the gauge, the measured strain for the cracked condition will be less than that for the uncracked pavement, and the strain data cannot be used to estimate an effective modulus for the asphalt layer. If cracks occur only in the active gauge area, then the measured strain for the cracked pavement will be greater than that for the uncracked pavement, and an effective modulus can be computed from layer theory. Since the active area of the gauge is small compared to the pavement, it is most likely that cracks will occur outside the active area, making it impossible to use the strain data to estimate a reduced modulus for the asphalt layer. Since surface defelctions represent an average response of the pavement over a fairly large influence area, they appear better suited for estimating effective asphalt moduli than the strain at the bottom of the asphalt layer which represents the response at a single point. The strains, however, can be used to detect the onset of fatigue failure in the pavement.

Finally, the pavement performance and response data from the first phase of research has been summarized in this report. This data base should be useful in various mechanistic/empical model development and validation efforts. Although environmental conditions could not be controlled, the phase 1 tests represent valid observations of pavement response and performance for the loads and environmental conditions encountered. The data from three load levels on the same nominal pavement thicknesses should be useful in verifying the ability of mechanistic/empirical design procedures to predict the observed failure mode.

RECOMMENDATIONS

The pavement performance data from the phase 1 test sections was highly variable along the length of the section. This variability was caused primarily by two factors: spacial variations in pavement thickness and material properties, and the dynamic loading applied by the ALF machine. Although both of these factors also exist on actual pavements, they should be minimized to obtain reliable data from future ALF tests.

Thickness and material variability can be minimized by specifying construction tolerances which are commensurate with the required level of variability based on the objectives of the experiment. For contracting convenience, the Virginia Department of Transportation specifications were used in construction of the phase 1 test sections. As is the case with most highway specifications, the tolerances in these specifications establish minimum levels. They do not necessarily ensure uniformity, which is the primary concern for the PTF pavement sections. For example, under the Virginia specifications, additional grading is not required for excessive base course thickness. The contractor is not paid for the extra thickness, but the material is permitted to remain in place. Required construction tolerances should be established as part of the experimental design for future PTF experiments. If the required tolerances are more restirctive than those typically used in highway construction, additional funding should be provided to cover the cost of the work.

To minimize the dynamic loading applied by the ALF, requires modification of the trolley assembly and the load pickup mechanism. On the Austrailian ALF, this was accomplished by replacing the original mechanical lift mechanism with a hydraulic actuator. FHWA considered the hydraulic system for the US ALF, but rejected it due to potential problems caused by leaking hydraulic fluid. A engineering analysis of various trolley modifications and lift mechanism alternatives was conducted with the objective of minimizing the load variation along the pavement. This analysis resulted in the recommendation of the replacement of the current lift mechanism with a cam actuated mechanism. Design and fabrication of the new lift mechanism is scheduled for the phase 2 research program.

The capabilities of the ALF are best suited to comparative studies. Future research using the ALF should, therefore, be designed as comparative experiments. During the first phase of research, it was demonstrated that the ALF can easily be moved between two adjacent lanes using the actuators which provide the machine's lateral movement capability. Through proper positioning of the test sections, this lateral movement capability can be used to limit the effect of the environment during comparative testing. By alternating the ALF between adjacent test sections on a weekly, or perhaps more frequent basis, the effect of the environment can be eliminated from the comparative tests. Although environmental conditions will vary during the testing, the variation will be the same for both test section. To effectively use this lateral movement capability, an additional set of transverse rails and linear actuators should be purchased. Also, the test sections at the PTF should be relocated to provide a series of parallel test lanes. Using the space currently allocated to the PTF, 12 adjacent test sections could be constructed if the pavements were rotated 90 degrees. Rotating the test sections would also provide greater accessibility during test pavement construction.

Consideration should be given to providing environmental control for the PTF. If the parallel test lane concept recommended above is adopted, a moveable building could be designed to cover two, or perhaps three test sections. Prior to testing, the pavement sections would receive normal environmental exposure. The moveable building would only provide environmental control during the accelerated load testing. The building could also be moved out of the way for test pavement construction. Finally, the environmental control could be added in stages. The building could be initially built with a minimal environmental control system, then upgraded in the future as additional funding becomes avaliable.

APPENDIX A. CONSTRUCTION NONDESTRUCTIVE TESTING

Table 19. Construction subgrade nondestructive testing.

Test No.	Lane	Sec	Sta	Off	Load, lb	Measured Deflections, mils					Composite Modulus, psi				
						.0	8.3	13.0	20.1	31.9	.0	8.3	13.0	20.1	31.9
1	1	1	35	R	5973	70.0	44.9	18.2	10.0	4.6	8066	4814	7185	8281	11291
2	1	1	35	L	7415	67.4	44.1	19.6	8.4	4.2	10399	6084	8282	12239	15352
3	1	1	42	R	5047	78.5	46.4	23.4	10.3	12.6	6077	3936	4722	6794	3483
4	1	1	42	L	5973	74.9	41.8	17.8	8.4	4.4	7538	5171	7346	9859	11604
5	1	1	49	R	6463	71.3	40.4	18.4	12.8	4.7	8568	5789	7690	7001	11958
6	1	1	49	L	5252	64.6	41.5	18.2	11.4	7.4	7685	4579	6317	6387	6172
7	1	2	70	R	7003	87.6	38.7	18.7	9.4	4.4	7556	6548	8198	10329	13840
8	1	2	70	L	6179	90.7	39.6	18.4	8.5	4.4	6439	5646	7352	10079	12212
9	1	2	77	R	5355	91.5	43.0	20.6	9.6	4.7	5532	4506	5691	7734	9908
10	1	2	77	L	4944	74.4	39.2	18.7	9.8	5.0	6281	4564	5788	6995	8598
11	1	2	84	R	6282	88.7	38.3	18.3	8.5	4.5	6694	5935	7515	10247	12139
12	1	2	84	L	6076	74.1	34.1	15.9	8.5	4.5	7751	6448	8366	9911	11741
13	1	3	105	R	4120	87.8	41.1	17.3	8.1	6.3	4436	3627	5214	7052	5687
14	1	3	105	L	5664	87.4	34.1	15.9	7.8	5.3	6126	6010	7799	10068	9293
15	1	3	112	R	3502	61.0	38.3	17.0	7.5	3.8	5427	3309	4510	6474	8014
16	1	3	112	L	5870	87.2	34.8	15.1	7.2	3.6	6363	6104	8510	11303	14179
17	1	3	119	R	6179	89.8	37.1	16.0	8.4	4.3	6504	6027	8454	10199	12496
18	1	3	119	L	6385	88.1	33.0	15.0	8.2	3.8	6851	7001	9319	10796	14611
19	1	4	140	R	5355	82.5	30.3	16.3	7.7	12.0	6135	6395	7192	9642	3880
20	1	4	140	L	5870	88.9	32.2	16.5	8.2	3.9	6241	6597	7788	9925	13088
21	1	4	147	R	3502	91.1	33.5	15.9	8.0	3.8	3634	3783	4822	6069	8014
22	1	4	147	L	3502	87.1	34.9	17.8	8.4	3.9	3800	3631	4307	5780	7808
23	1	4	154	R	7518	91.7	29.2	16.0	8.1	3.9	7749	9317	10287	12868	16763
24	1	4	154	L	5767	90.8	38.1	15.4	7.8	3.7	6003	5477	8198	10251	13554
25	2	1	35	R	4429	76.2	28.0	16.2	10.0	6.2	5494	5724	5985	6141	6212
26	2	1	35	L	3708	89.4	28.8	17.3	10.0	5.9	3921	4659	4692	5141	5465
27	2	1	42	R	6179	67.2	30.4	15.9	12.9	5.6	8691	7355	8508	6641	9595
28	2	1	42	L	7106	78.5	34.5	16.3	9.6	5.8	8556	7453	9544	10263	10654
29	2	1	49	R	7621	90.3	33.7	16.2	9.0	5.0	7977	8183	10299	11740	13254
30	2	1	49	L	5150	86.7	34.5	15.2	8.9	5.0	5615	5402	7417	8023	8957
31	2	2	70	R	7209	76.5	37.0	18.9	8.5	3.5	8907	7050	8350	11759	17911
32	2	2	70	L	5767	81.9	33.9	16.4	8.1	7.0	6656	6156	7698	9871	7164
33	2	2	77	R	5870	65.8	41.2	21.2	10.5	4.8	8432	5156	6062	7751	10634
34	2	2	77	L	5252	70.7	38.7	19.0	8.9	3.9	7022	4911	6051	8182	11710
35	2	2	84	R	5973	90.7	36.5	17.2	8.5	3.7	6225	5922	7602	9743	14038
36	2	2	84	L	3708	73.6	25.2	16.1	8.3	3.7	4762	5324	5042	6194	8715
37	2	3	105	R	7621	75.6	31.1	14.3	6.1	2.9	9529	8867	11667	17322	22852
38	2	3	105	L	7518	77.4	30.0	14.9	7.0	3.3	9181	9068	11046	14891	19810
39	2	3	112	R	5458	67.9	24.3	10.1	5.6	2.9	7598	8128	11830	13513	16366
40	2	3	112	L	7518	90.0	28.1	12.5	5.8	3.0	7896	9681	13167	17971	21792
41	2	3	119	R	5458	75.0	29.8	11.9	5.4	2.9	6879	6628	10041	14014	16366
42	2	3	119	L	7518	74.3	31.7	15.0	6.6	3.5	9564	8582	10972	15793	18678
43	2	4	140	R	4635	81.1	33.5	18.3	7.9	3.5	5402	5007	5545	8134	11516
44	2	4	140	L	5870	88.5	38.3	19.4	7.6	3.5	6270	5546	6624	10709	14584
45	2	4	147	R	5973	76.1	38.5	17.3	7.8	3.5	7419	5614	7559	10617	14840
46	2	4	147	L	7209	66.1	39.0	17.2	8.1	3.7	10309	6689	9176	12339	16943
47	2	4	154	R	7415	66.3	35.0	17.0	7.9	3.5	10572	7666	9549	13013	18423
48	2	4	154	L	5767	71.7	33.6	16.7	8.1	3.9	7603	6211	7560	9871	12859

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Table 20. Construction base nondestructive testing.

Test No.	Lane	Sec	Sta	Off	Load, lb	Measured Deflections, mils						Composite Modulus, psi					
						.0	8.3	13.0	20.1	31.9	50.0	.0	8.3	13.0	20.1	31.9	50.0
1	1	1	35	R	6799	41.8	39.4	19.2	8.1	3.7	2.1	15385	6237	7747	11623	15807	17663
2	1	1	35	L	6592	74.7	38.5	18.3	7.1	3.6	2.2	8339	6201	7866	12826	15826	16224
3	1	1	42	R	6592	81.2	37.8	17.0	8.0	3.9	2.1	7675	6311	8485	11492	14560	17125
4	1	1	42	L	6799	73.3	34.0	15.8	6.8	3.6	2.1	8767	7741	9428	13840	16323	17663
5	1	1	49	R	6799	82.5	36.8	15.7	7.8	4.1	2.3	7792	6684	9452	12154	14439	16445
6	1	1	49	L	6799	67.8	33.1	15.2	6.9	3.6	2.1	9474	7422	9820	13682	16323	17663
7	1	2	70	R	6799	80.7	31.3	16.7	7.8	4.1	2.0	7959	7861	8896	12154	14439	18342
8	1	2	70	L	6799	79.0	36.1	15.6	7.6	4.1	1.7	8137	6815	9523	12342	14580	21677
9	1	2	77	R	6592	84.1	34.6	17.8	7.7	4.3	2.2	7410	6901	8128	11905	13358	16513
10	1	2	77	L	6799	73.2	35.4	16.7	8.2	3.9	1.9	8776	6951	8938	11511	15017	20293
11	1	2	84	R	7006	86.7	34.5	16.7	7.5	4.0	2.1	7642	7342	9210	12985	15171	18201
12	1	2	84	L	7212	83.5	30.7	13.5	7.2	8.8	6.9	8168	8487	11692	13803	7111	5815
13	1	3	105	R	6799	76.0	35.9	17.2	8.0	3.7	2.2	8458	6845	8671	11853	15807	17342
14	1	3	105	L	6799	83.3	31.8	15.9	7.2	3.4	1.9	7718	7744	9335	13156	17261	19465
15	1	3	112	R	6799	77.2	36.1	15.6	6.9	3.3	2.0	8324	6815	9547	13761	17667	19076
16	1	3	112	L	7006	63.4	35.0	16.7	7.3	4.1	1.9	10448	7252	9188	13336	14879	20911
17	1	3	119	R	6799	87.7	32.3	16.1	6.7	3.6	2.0	7330	7621	9221	14002	16323	18702
18	1	3	119	L	6799	68.8	28.3	19.5	7.0	3.4	1.9	9339	8691	7622	13376	17261	19465
19	1	4	140	R	7006	58.1	31.2	14.4	6.5	3.4	1.9	11388	8131	10615	14953	17787	20476
20	1	4	140	L	6799	56.2	28.5	15.6	7.2	3.4	2.0	11431	8631	9547	13013	17261	19076
21	1	4	147	R	7212	57.5	29.8	14.8	7.0	3.5	2.1	11860	8745	10637	14189	18101	19089
22	1	4	147	L	6799	53.0	28.2	15.2	6.7	3.3	1.8	12137	8716	9820	14002	18093	21195
23	1	4	154	R	8038	26.7	20.9	16.7	7.0	3.4	1.9	28506	13887	10517	15903	20644	23492
24	1	4	154	L	7006	67.6	30.2	15.9	7.4	3.5	1.8	9791	8396	9619	13194	17387	21841
25	2	1	35	R	8451	51.5	27.8	17.5	9.6	5.7	3.5	15512	11002	10584	12147	12785	13321
26	2	1	35	L	8658	51.7	29.9	17.4	10.6	5.9	3.5	15844	10471	10892	11335	12834	13647
27	2	1	42	R	9055	43.7	22.7	14.7	8.6	5.2	3.4	19603	14449	13463	14628	15267	14771
28	2	1	42	L	8864	44.3	23.5	14.3	7.6	5.0	3.3	18917	13670	13541	16090	15416	14803
29	2	1	49	R	8864	42.2	21.6	13.7	7.8	4.6	3.0	19834	14867	14123	15765	16592	16580
30	2	1	49	L	8658	74.4	23.2	14.1	8.0	4.5	2.8	10993	13511	13411	15020	16629	16869
31	2	2	70	R	8451	88.8	28.5	16.6	9.3	4.7	2.3	8998	10729	11162	12664	15555	20440
32	2	2	70	L	8451	73.2	29.1	16.2	8.3	3.9	3.3	10914	10525	11406	14105	18854	14114
33	2	2	77	R	8451	55.6	32.0	20.3	10.2	4.9	2.3	14370	9566	9107	11491	15053	20440
34	2	2	77	L	8451	67.9	32.2	19.3	9.6	4.5	2.4	11762	9484	9571	12147	16374	19435
35	2	2	84	R	8451	81.3	28.3	17.4	9.0	4.3	2.2	9830	10803	10632	12996	17283	21170
36	2	2	84	L	8658	50.7	29.5	18.3	8.9	4.2	2.1	16152	10610	10376	13432	18041	22492
37	2	3	105	R	9055	80.1	24.3	14.3	7.5	3.7	1.9	10688	13489	13909	16695	21053	25924
38	2	3	105	L	8967	47.2	24.8	14.4	7.8	3.8	2.2	17956	13082	13586	15868	20418	22463
39	2	3	112	R	9261	63.7	24.8	15.7	8.3	4.0	2.2	13742	13533	12906	15530	20252	23621
40	2	3	112	L	9468	51.0	30.8	18.1	9.8	4.3	2.4	17540	11114	11420	13391	19011	22137
41	2	3	119	R	8864	61.7	21.0	17.7	8.3	4.0	2.2	13581	15285	10978	14865	19384	22205
42	2	3	119	L	8658	42.7	24.9	14.7	7.1	3.7	2.2	19176	12591	12907	16939	20130	21689
43	2	4	140	R	8658	44.6	25.7	16.8	9.1	4.1	2.1	18331	12186	11301	13257	18212	22492
44	2	4	140	L	8245	43.5	25.7	16.3	8.7	4.1	2.2	17898	11605	11048	13198	17344	21030
45	2	4	147	R	9055	80.8	25.2	16.1	8.5	4.1	2.3	10589	13024	12341	14832	19231	21901
46	2	4	147	L	8864	46.0	25.9	17.8	9.1	4.3	2.2	18205	12382	10905	13572	17962	22205
47	2	4	154	R	8864	40.9	23.0	15.9	8.8	4.1	2.2	20483	13950	12200	13935	18825	22205
48	2	4	154	L	8451	40.2	22.0	14.1	7.5	3.8	2.2	19892	13871	13090	15582	19243	21170

Table 21. Construction completed pavement nondestructive testing.

Test No.	Lane	Sec	Sta	Off	Surf Temp, F	Load, lb	Measured Deflections, mils						Composite Modulus, psi					
							.0	8.3	13.0	20.1	31.9	50.0	.0	8.3	13.0	20.1	31.9	50.0
1	1	1	35	R	96	8445	57.2	40.2	29.3	14.4	4.9	2.5	13955	7602	6310	8131	14987	18657
2	1	1	35	L	95	8651	51.6	35.7	25.4	12.2	4.5	2.5	15847	8769	7456	9831	16717	19112
3	1	1	42	R	91	8445	56.9	39.8	29.4	15.1	5.7	3.0	14029	7678	6288	7754	12883	15547
4	1	1	42	L	95	8651	48.8	34.1	24.3	12.1	4.8	2.7	16757	9180	7794	9913	15672	17696
5	1	1	49	R	93	8445	61.5	42.8	31.0	15.4	5.4	2.7	12980	7140	5964	7603	13599	17275
6	1	1	49	L	95	8754	49.3	33.2	23.1	11.0	4.5	2.7	16784	9541	8296	11034	16916	17907
7	1	2	70	R	93	8651	49.3	34.7	25.4	13.2	5.2	2.5	16587	9021	7456	9087	14467	19112
8	1	2	70	L	93	8651	51.8	35.7	25.3	12.6	4.8	2.3	15786	8769	7486	9519	15672	20774
9	1	2	77	R	93	8445	48.9	34.7	25.4	13.2	5.2	2.5	16324	8807	7279	8870	14122	18657
10	1	2	77	L	94	8651	49.3	33.8	24.1	12.0	4.8	2.3	16587	9262	7858	9995	15672	20774
11	1	2	84	R	92	8651	50.8	34.7	24.9	12.5	5.0	2.5	16097	9021	7606	9595	15045	19112
12	1	2	84	L	93	8651	47.9	32.2	22.4	11.0	4.4	2.4	17071	9722	8455	10904	17097	19908
13	1	3	105	R	92	8651	57.0	39.0	27.6	13.6	5.1	2.4	14346	8027	6862	8819	14750	19908
14	1	3	105	L	94	8651	52.0	34.7	23.9	11.3	4.4	2.4	15725	9021	7924	10614	17097	19908
15	1	3	112	R	91	8651	48.6	33.9	24.5	12.4	4.7	2.3	16826	9234	7730	9673	16006	20774
16	1	3	112	L	95	8651	48.5	32.4	22.6	11.1	4.2	2.2	16860	9662	8380	10806	17911	21718
17	1	3	119	R	92	8651	45.4	31.9	23.3	12.1	4.7	2.3	18012	9813	8128	9913	16006	20774
18	1	3	119	L	95	8651	45.7	30.9	21.5	10.8	4.3	2.2	17893	10131	8809	11106	17495	21718
19	1	4	140	R	91	8651	45.9	31.0	21.9	11.2	4.5	2.2	17815	10098	8648	10709	16717	21718
20	1	4	140	L	95	8651	48.3	31.3	20.6	10.0	4.2	2.2	16930	10001	9194	11994	17911	21718
21	1	4	147	R	91	8651	45.2	29.2	19.8	9.8	4.4	2.2	18091	10721	9565	12239	17097	21718
22	1	4	147	L	94	8651	46.0	29.6	19.6	9.8	4.3	2.1	17777	10576	9663	12239	17495	22752
23	1	4	154	R	90	8651	47.3	27.3	23.0	11.7	4.6	2.2	17288	11467	8234	10251	16354	21718
24	1	4	154	L	93	8651	46.9	31.4	22.0	11.0	4.5	2.2	17435	9970	8609	10904	16717	21718
25	2	1	35	R	83	7827	16.4	11.7	9.4	6.1	3.5	2.3	45112	24207	18229	17790	19446	18795
26	2	1	35	L	84	7621	18.2	13.1	10.5	6.7	3.8	2.4	39580	21051	15890	15770	17440	17538
27	2	1	42	R	88	8033	14.9	10.4	8.2	5.3	3.2	2.2	50960	27950	21446	21014	21829	20166
28	2	1	42	L	89	7930	17.5	12.4	9.8	6.2	3.5	2.4	42833	23141	17715	17733	19702	18249
29	2	1	49	R	88	8033	15.4	10.7	8.5	5.4	3.1	2.0	49306	27166	20689	20625	22533	22183
30	2	1	49	L	89	7621	18.4	13.2	10.5	6.5	3.4	2.0	39150	20892	15890	16256	19491	21045
31	2	2	70	R	88	7827	17.5	12.6	9.9	6.2	3.1	1.6	42276	22478	17308	17503	21955	27018
32	2	2	70	L	86	7827	18.9	13.1	10.3	6.4	3.2	1.6	39145	21620	16636	16956	21269	27018
33	2	2	77	R	89	8033	17.2	12.7	10.2	6.7	3.5	1.8	44146	22888	17241	16623	19958	24648
34	2	2	77	L	89	8033	20.0	14.3	11.3	7.2	3.6	1.8	37965	20327	15563	15469	19404	24648
35	2	2	84	R	88	8033	16.5	11.8	9.3	5.9	3.0	1.5	46019	24634	18910	18877	23284	29578
36	2	2	84	L	90	7827	18.9	13.7	10.8	6.8	3.4	1.7	39145	20673	15866	15959	20018	25429
37	2	3	105	R	89	8239	14.1	9.7	7.7	5.0	2.7	1.5	55233	30736	23425	22846	26535	30336
38	2	3	105	L	90	7930	16.8	11.9	9.6	6.0	3.0	1.6	44617	24114	18084	18324	22986	27373
39	2	3	112	R	87	8239	14.3	10.0	8.0	5.1	2.8	1.5	54460	29814	22546	22398	25587	30336
40	2	3	112	L	89	7827	16.4	12.0	9.7	6.4	3.3	1.7	45112	23602	17665	16956	20625	25429
41	2	3	119	R	88	8239	15.2	10.6	8.4	5.4	2.9	1.5	51236	28126	21473	21154	24705	30336
42	2	3	119	L	90	7827	16.3	11.6	9.3	6.0	3.1	1.6	45389	24416	18425	18086	21955	27018
43	2	4	140	R	87	8239	13.4	9.3	7.4	4.8	2.6	1.5	58118	32058	24374	23798	27555	30336
44	2	4	140	L	89	8033	15.4	10.4	8.1	5.0	2.7	1.5	49306	27950	21711	22275	25871	29578
45	2	4	147	R	86	8445	14.0	9.4	7.4	4.7	2.6	1.5	57018	32510	24984	24912	28244	31094
46	2	4	147	L	89	8033	15.5	10.6	8.3	5.3	2.8	1.5	48988	27423	21188	21014	24947	29578
47	2	4	154	R	86	9887	17.5	11.9	9.4	6.1	3.3	1.8	53403	30065	23026	22472	26053	30337
48	2	4	154	L	87	8239	15.2	10.4	8.1	5.1	2.8	1.6	51236	28667	22268	22398	25587	28440

APPENDIX B. ENVIRONMENTAL AND REFERENCE LOCATION NDT

Table 22. Phase 1 environmental history.

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
8/30/86	41	73	.00	.00			17.1	22.3
8/31/86	44	76	.00	.00				
9/ 1/86	54	74	.16	.00				
9/ 2/86	59	71	.50	.00				
9/ 3/86	65	73	.13	.00				
9/ 4/86	64	77	.00	.00				
9/ 5/86	68	74	.00	.00				
9/ 6/86	57	81	.00	.00				
9/ 7/86	50	76	.00	.00				
9/ 8/86	47	69	.14	.00				
9/ 9/86	40	75	.00	.00				
9/10/86	47	75	.00	.00				
9/11/86	65	83	.00	.00				
9/12/86	63	85	.00	.00				
9/13/86	53	77	.00	.00				
9/14/86	48	77	.00	.00				
9/15/86	55	81	.00	.00				
9/16/86	46	70	.00	.00				
9/17/86	35	68	.00	.00				
9/18/86	39	73	.00	.00				
9/19/86	61	81	.01	.00				
9/20/86	59	82	.00	.00				
9/21/86	58	84	.00	.00				
9/22/86	63	75	.00	.00				
9/23/86	65	88	.00	.00				
9/24/86	67	85	.00	.00				
9/25/86	65	90	.05	.00				
9/26/86	62	92	.00	.00				
9/27/86	65	86	.00	.00				
9/28/86	63	70	.05	.00				
9/29/86	68	85	.00	.00				
9/30/86	68	92	.00	.00				
10/ 1/86	66	90	.04	.00				
10/ 2/86	62	89	.00	.00				
10/ 3/86	58	85	.00	.00				
10/ 4/86	69	85	.02	.00				
10/ 5/86	58	79	.00	.00				
10/ 6/86	42	64	.00	.00				
10/ 7/86	32	64	.00	.00				
10/ 8/86	37	78	.00	.00				
10/ 9/86	53	80	.00	.00				
10/10/86	37	59	.00	.00				
10/11/86	33	65	.00	.00				
10/12/86	39	67	.00	.00				
10/13/86	59	67	.36	.00				
10/14/86	49	76	.19	.00				
10/15/86	35	60	.00	.00				
10/16/86	30	63	.00	.00				
10/17/86	38	59	.00	.00				
10/18/86	32	59	.00	.00				
10/19/86	27	62	.00	.00				
10/20/86	27	65	.00	.00				
10/21/86	28	72	.00	.00				
10/22/86	40	77	.00	.00				
10/23/86	42	78	.00	.00				
10/24/86	47	72	.00	.00				
10/25/86	50	57	.10	.00				
10/26/86	52	59	.42	.00				
10/27/86	55	71	.17	.00				
10/28/86	41	69	.00	.00				
10/29/86	35	68	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
10/30/86	46	67	.00	.00				
10/31/86	55	71	.00	.00				
11/ 1/86	41	69	.04	.00				
11/ 2/86	35	68	.44	.00				
11/ 3/86	46	67	.00	.00				
11/ 4/86	36	58	.04	.00				
11/ 5/86	34	58	.92	.00				
11/ 6/86	47	71	.00	.00				
11/ 7/86	33	57	.28	.00				
11/ 8/86	42	57	.01	.00				
11/ 9/86	38	49	.00	.00				
11/10/86	39	59	.00	.00				
11/11/86	41	51	.66	.00				
11/12/86	49	67	.00	.00				
11/13/86	51	74	.00	.00				
11/14/86	32	53	.00	.00				
11/15/86	33	44	.00	.00				
11/16/86	37	53	.00	.00				
11/17/86	23	44	.00	.00				
11/18/86	13	38	.33	.00				
11/19/86	19	45	.00	.00				
11/20/86	38	53	.68	.00				
11/21/86	28	60	.00	.00				
11/22/86	31	59	.00	.00				
11/23/86	23	52	.01	.00				
11/24/86	22	36	.03	.00				
11/25/86	32	48	.00	.00				
11/26/86	29	52	.73	.00				
11/27/86	25	54	.00	.00				
11/28/86	38	53	.00	.00				
11/29/86	26	52	.00	.00				
11/30/86	40	51	.00	.00				
12/ 1/86	35	57	.00	.00				
12/ 2/86	29	52	1.42	.00				
12/ 3/86	28	58	.02	.00	17.3	18.6		
12/ 4/86	27	50	.00	.00				
12/ 5/86	30	39	.00	.00				
12/ 6/86	37	53	.00	.00				
12/ 7/86	40	61	.00	.00				
12/ 8/86	29	49	.02	.00				
12/ 9/86	21	40	.32	.00				
12/10/86	17	45	.01	.00	17.4	18.6		
12/11/86	22	52	.51	.00				
12/12/86	41	54	.00	.00				
12/13/86	44	55	.00	.00				
12/14/86	41	57	.00	.00				
12/15/86	33	41	.00	.00				
12/16/86	34	40	.00	.00				
12/17/86	15	36	.00	.00				
12/18/86	13	39	.52	.00				
12/19/86	19	54	.00	.00				
12/20/86	23	53	.00	.00				
12/21/86	30	51	.00	.00				
12/22/86	38	47	.00	.00				
12/23/86	33	47	.00	.00				
12/24/86	25	41	2.01	.00				
12/25/86	21	41	.00	.00				
12/26/86	15	43	.00	.00				
12/27/86	16	45	.00	.00				
12/28/86	31	46	.00	.00				
12/29/86	37	53	.00	.00				
12/30/86	31	44	.00	.00				
12/31/86	24	42	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
1/ 1/87	21	40	.29	2.10				
1/ 2/87	17	42	.24	3.00				
1/ 3/87	23	39	.00	.00				
1/ 4/87	25	45	.00	.00				
1/ 5/87	22	39	.00	.00				
1/ 6/87	17	46	.00	.00				
1/ 7/87	36	55	.00	.00				
1/ 8/87	29	43	.00	.00				
1/ 9/87	28	45	.00	.00				
1/10/87	33	42	.06	.00				
1/11/87	30	43	.00	.00				
1/12/87	28	45	.00	.00				
1/13/87	27	49	.00	.00				
1/14/87	24	66	.00	.00				
1/15/87	45	60	.14	.00				
1/16/87	37	50	.00	.00				
1/17/87	27	38	.00	.00				
1/18/87	31	34	.38	.00				
1/19/87	33	42	1.36	.00				
1/20/87	34	42	.00	.00				
1/21/87	31	40	.00	.00				
1/22/87	26	32	1.18	11.10				
1/23/87	5	31	.00	.00				
1/24/87	-2	25	.00	.00				
1/25/87	-5	18	.24	4.10				
1/26/87	3	26	.30	6.10				
1/27/87	-9	24	.00	.00				
1/28/87	-17	35	.00	.00				
1/29/87	-1	41	.24	1.50				
1/30/87	28	44	.10	.90				
1/31/87	29	40	.00	.00				
2/ 1/87	18	40	.00	.00				
2/ 2/87	27	58	.00	.00				
2/ 3/87	20	50	.00	.00				
2/ 4/87	34	45	.00	.00				
2/ 5/87	25	43	.00	.00				
2/ 6/87	18	52	.00	.00	14.1	19.3		
2/ 7/87	23	51	.00	.00				
2/ 8/87	24	53	.02	.00				
2/ 9/87	23	33	.00	.00				
2/10/87	20	48	.00	.00				
2/11/87	20	47	.00	.00				
2/12/87	25	43	.12	.00	16.4	17.8		13.5
2/13/87	28	44	.00	.00				
2/14/87	19	39	.00	.00				
2/15/87	14	29	.00	.00				
2/16/87	11	28	.00	.00				
2/17/87	28	37	.00	.00				
2/18/87	20	44	.00	.00	16.8	18.8		
2/19/87	14	45	.00	.00				
2/20/87	15	45	.00	.00				
2/21/87	23	48	.00	.00				
2/22/87	19	48	.38	3.10				
2/23/87	32	46	1.34	8.90				
2/24/87	28	45	.00	.00				
2/25/87	16	43	.00	.00	16.8	18.6		
2/26/87	16	42	.00	.00				
2/27/87	28	41	.00	.00				
2/28/87	31	44	.61	.00				
3/ 1/87	43	69	.28	.00				
3/ 2/87	37	53	.00	.00	16.7	18.2		
3/ 3/87	31	55	.00	.00				
3/ 4/87	23	37	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
3/ 5/87	16	43	.00	.00				
3/ 6/87	21	60	.00	.00				
3/ 7/87	31	75	.00	.00				
3/ 8/87	30	76	.00	.00				
3/ 9/87	28	66	.03	.00				
3/10/87	19	34	.01	.00				
3/11/87	19	40	.00	.00				
3/12/87	22	47	.00	.00				
3/13/87	25	46	.00	.00	17.8	18.0		13.7
3/14/87	19	48	.00	.00				
3/15/87	32	42	.19	.50				
3/16/87	25	47	.09	.90				
3/17/87	22	54	.00	.00				
3/18/87	23	58	.00	.00				
3/19/87	28	56	.00	.00				
3/20/87	24	61	.00	.00	17.6	17.7		
3/21/87	35	53	.00	.00				
3/22/87	31	57	.00	.00				
3/23/87	25	63	.00	.00				
3/24/87	28	68	.00	.00				
3/25/87	34	64	.07	.00				
3/26/87	47	71	.00	.00				
3/27/87	37	70	.00	.00				
3/28/87	43	65	.35	.00				
3/29/87	42	73	.00	.00				
3/30/87	53	60	.23	.00				
3/31/87	31	63	.21	.00				
4/ 1/87	20	50	.00	.00	18.2	19.1		
4/ 2/87	33	63	.10	.00				
4/ 3/87	32	46	.51	.00				
4/ 4/87	36	56	1.47	.00				
4/ 5/87	32	42	.11	.00				
4/ 6/87	32	45	.31	.50				
4/ 7/87	43	57	.00	.00				
4/ 8/87	39	63	.00	.00	17.9	18.2		
4/ 9/87	33	61	.00	.00				
4/10/87	39	71	.00	.00				
4/11/87	41	75	.01	.00				
4/12/87	39	67	.01	.00				
4/10/87	39	71	.00	.00				
4/14/87	37	67	.00	.00				
4/15/87	46	53	.16	.00				
4/16/87	46	50	.79	.00	17.1	18.5		
4/17/87	49	64	.37	.00				
4/18/87	54	65	.00	.00				
4/19/87	53	71	.00	.00				
4/20/87	54	75	.00	.00				
4/21/87	56	78	.00	.00				
4/22/87	50	86	.00	.00				
4/23/87	51	61	.00	.00				
4/24/87	50	59	.69	.00				
4/25/87	39	52	.08	.00				
4/26/87	36	65	.00	.00				
4/27/87	31	66	.00	.00				
4/28/87	37	59	.00	.00				
4/29/87	32	77	.00	.00				
4/30/87	48	67	.00	.00	18.4	18.4		
5/ 1/87	36	72	.00	.00				
5/ 2/87	46	71	.01	.00				
5/ 3/87	51	78	.39	.00				
5/ 4/87	42	53	.72	.00				
5/ 5/87	34	65	.00	.00				
5/ 6/87	37	75	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
5/ 7/87	41	80	.00	.00	17.4	18.2		
5/ 8/87	43	70	.01	.00				
5/ 9/87	37	79	.00	.00				
5/10/87	44	87	.00	.00				
5/11/87	50	89	.00	.00				
5/12/87	62	88	.21	.00				
5/13/87	54	67	.00	.00				
5/14/87	53	69	.00	.00	17.5	19.5		
5/15/87	53	80	.36	.00				
5/16/87	45	73	.00	.00				
5/17/87	47	87	.00	.00				
5/18/87	53	91	.00	.00				10.8
5/19/87	52	67	.10	.00				
5/20/87	49	57	.39	.00				
5/21/87	53	71	.03	.00	16.4	17.7		
5/22/87	53	79	.00	.00				
5/23/87	65	85	.00	.00				
5/24/87	64	85	.02	.00				
5/25/87	60	69	.03	.00				
5/26/87	58	68	.00	.00				
5/27/87	60	73	.00	.00				
5/28/87	62	84	.00	.00	17.2	18.3		
5/29/87	60	92	.00	.00				
5/30/87	64	95	.00	.00				
5/31/87	67	89	.06	.00				
6/ 1/87	64	90	.04	.00				
6/ 2/87	62	87	.00	.00				
6/ 3/87	65	86	.17	.00				
6/ 4/87	60	76	.56	.00	17.3	18.5		
6/ 5/87	53	79	.00	.00				
6/ 6/87	54	80	.00	.00				
6/ 7/87	53	89	.00	.00				
6/ 8/87	62	93	.00	.00				
6/ 9/87	62	83	.00	.00				
6/10/87	50	76	.00	.00				
6/11/87	45	80	.00	.00				
6/12/87	65	80	.09	.00				
6/13/87	64	89	.29	.00				
6/14/87	62	91	.00	.00				
6/15/87	70	94	.00	.00				
6/16/87	65	83	.00	.00				
6/17/87	60	87	.00	.00				
6/18/87	61	87	.00	.00				
6/19/87	63	91	.00	.00				
6/20/87	69	93	.93	.00				
6/21/87	69	87	.23	.00				
6/22/87	68	91	.29	.00				
6/23/87	72	86	.00	.00	17.2	18.2		
6/24/87	63	84	.00	.00				
6/25/87	57	89	.00	.00				
6/26/87	66	82	.77	.00				
6/27/87	63	85	.01	.00				
6/28/87	51	81	.00	.00				
6/29/87	53	88	.00	.00				
6/30/87	68	93	.00	.00				
7/ 1/87	65	92	.00	.00				
7/ 2/87	71	88	.00	.00				
7/ 3/87	70	90	.00	.00				
7/ 4/87	72	86	.00	.00				
7/ 5/87	68	86	.00	.00				
7/ 6/87	68	83	.40	.00				
7/ 7/87	73	92	.00	.00				
7/ 8/87	71	96	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
7/ 9/87	74	93	.00	.00				
7/10/87	74	92	.00	.00				
7/11/87	70	94	.00	.00				
7/12/87	68	94	.00	.00				
7/13/87	66	92	.40	.00				
7/14/87	63	86	.00	.00				
7/15/87	53	78	.20	.00				
7/16/87	60	80	.00	.00				
7/17/87	57	85	.00	.00				
7/18/87	63	91	.00	.00				
7/19/87	65	92	.00	.00				
7/20/87	67	95	.00	.00				
7/21/87	77	98	.00	.00				
7/22/87	71	96	.00	.00	16.8	18.5		
7/23/87	70	96	.00	.00				
7/24/87	74	97	.00	.00				
7/25/87	72	97	.00	.00				
7/26/87	70	93	.00	.00				
7/27/87	68	92	.00	.00				
7/28/87	63	88	.00	.00				
7/29/87	58	88	.00	.00				
7/30/87	62	93	.00	.00				17.3
7/31/87	67	93	.00	.00				
8/ 1/87	69	87	.00	.00				
8/ 2/87	70	90	.00	.00				
8/ 3/87	74	97	.00	.00	16.6	18.1		
8/ 4/87	71	97	.00	.00				
8/ 5/87	70	89	.00	.00				
8/ 6/87	69	87	.10	.00				
8/ 7/87	65	86	.00	.00				
8/ 8/87	70	93	.00	.00				
8/ 9/87	73	95	.00	.00				
8/10/87	67	93	.00	.00				
8/11/87	58	87	.00	.00				
8/12/87	56	87	.00	.00				
8/13/87	60	86	.00	.00				
8/14/87	57	87	.00	.00	17.7	18.3		
8/15/87	63	90	.00	.00				
8/16/87	70	89	.00	.00				
8/17/87	70	98	.00	.00				
8/18/87	68	95	.00	.00				
8/19/87	66	86	.00	.00				
8/20/87	59	89	.00	.00				
8/21/87	52	90	.00	.00	18.0	18.4		
8/22/87	71	77	.20	.00				
8/23/87	58	81	.00	.00				
8/24/87	46	80	.00	.00				
8/25/87	49	74	.00	.00				
8/26/87	61	78	.00	.00				
8/27/87	63	100	.00	.00	16.4	18.5	14.5	17.3
8/28/87	70	83	.20	.00				
8/29/87	55	82	.00	.00				
8/30/87	49	81	.00	.00				
8/31/87	60	82	.10	.00				
9/ 1/87	51	81	.00	.00				
9/ 2/87	45	85	.00	.00				
9/ 3/87	55	80	.00	.00	17.4	18.4		
9/ 4/87	53	80	.00	.00				
9/ 5/87	54	72	.00	.00				
9/ 6/87	63	71	.00	.00				
9/ 7/87	67	81	.00	.00				
9/ 8/87	69	74	1.30	.00				
9/ 9/87	66	86	2.20	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
9/10/87	67	85	.00	.00	15.8	18.5		
9/11/87	64	85	.00	.00				
9/12/87	67	83	.00	.00				
9/13/87	66	83	.00	.00				
9/14/87	63	86	4.00	.00				
9/15/87	58	86	.00	.00				
9/16/87	61	86	.00	.00				
9/17/87	66	87	.00	.00	16.3	17.1		
9/18/87	66	85	.80	.00				
9/19/87	61	71	.00	.00				
9/20/87	61	65	.00	.00				
9/21/87	59	78	.40	.00				
9/22/87	55	77	.00	.00				
9/23/87	51	74	.00	.00	17.3	18.4		
9/24/87	51	77	.00	.00				
9/25/87	47	69	.00	.00				
9/26/87	41	75	.00	.00				
9/27/87	51	81	.00	.00				
9/28/87	51	83	.00	.00				
9/29/87	56	81	.00	.00				
9/30/87	55	75	.20	.00				13.4
10/ 1/87	43	65	.00	.00				
10/ 2/87	40	73	.00	.00				
10/ 3/87	44	62	.00	.00				
10/ 4/87	40	59	.00	.00				
10/ 5/87	35	69	.70	.00	16.9	18.8		
10/ 6/87	41	71	.00	.00				
10/ 7/87	41	64	.00	.00				
10/ 8/87	34	58	.00	.00				
10/ 9/87	29	63	.00	.00	16.8	18.4		
10/10/87	47	75	.00	.00				
10/11/87	47	61	.00	.00				
10/12/87	33	55	.00	.00				
10/13/87	30	58	.00	.00				
10/14/87	29	62	.00	.00				
10/15/87	28	67	.00	.00				
10/16/87	32	75	.00	.00	16.5	18.1		
10/17/87	35	70	.00	.00				
10/18/87	37	68	.00	.00				
10/19/87	37	72	.00	.00				
10/20/87	46	73	.00	.00				
10/21/87	36	59	.10	.00				
10/22/87	33	57	.00	.00				
10/23/87	33	68	.00	.00				
10/24/87	36	72	.00	.00				
10/25/87	30	58	.00	.00				
10/26/87	26	60	.00	.00				
10/27/87	29	49	.00	.00				
10/28/87	30	58	1.40	.00				
10/29/87	27	57	.00	.00			8.8	13.9
10/30/87	30	66	.00	.00				
10/31/87	39	69	.00	.00				
11/ 1/87	36	71	.00	.00				
11/ 2/87	39	70	.00	.00	16.8	18.6		
11/ 3/87	41	75	.00	.00				
11/ 4/87	47	80	.00	.00				
11/ 5/87	45	67	.00	.00				
11/ 6/87	27	51	.00	.00	17.2	19.3		
11/ 7/87	28	63	.00	.00				
11/ 8/87	42	77	.00	.00				
11/ 9/87	56	70	.00	.00				
11/10/87	31	57	.50	.00				
11/11/87	29	34	.50	6.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
11/12/87	27	49	.00	2.00				
11/13/87	26	59	.00	.00	16.1	18.7		
11/14/87	28	68	.00	.00				
11/15/87	32	62	.00	.00				
11/16/87	32	68	.00	.00				
11/17/87	53	71	.38	.00				
11/18/87	47	68	.00	.00				
11/19/87	34	54	.00	.00	16.3	18.8		
11/20/87	29	50	.00	.00				
11/21/87	24	30	.00	.00				
11/22/87	21	41	.00	.00				
11/23/87	20	57	.00	.00				
11/24/87	46	63	.00	.00				
11/25/87	39	66	.00	.00	16.0	19.6		
11/26/87	46	71	.00	.00				
11/27/87	38	46	.00	.00				
11/28/87	39	45	.00	.00				
11/29/87	44	54	.00	.00				
11/30/87	38	49	2.25	.00				13.8
12/ 1/87	28	50	.00	.00				
12/ 2/87	33	45	.00	.00				
12/ 3/87	26	44	.00	.00				
12/ 4/87	26	58	.15	.00	15.9	18.3		
12/ 5/87	41	71	.00	.00				
12/ 6/87	37	50	.00	.00				
12/ 7/87	25	48	.08	.00				
12/ 8/87	24	50	.00	.00				
12/ 9/87	30	64	.00	.00				
12/10/87	40	54	.00	.00	15.9	18.1		
12/11/87	40	54	.37	.00				
12/12/87	33	58	.00	.00				
12/13/87	28	48	.00	.00				
12/14/87	32	45	.00	.00				
12/15/87	36	42	.72	.00				
12/16/87	35	41	.00	.00				
12/17/87	34	40	.00	.00				
12/18/87	28	40	.00	.00	16.0	17.8		
12/19/87	30	45	.00	.00				
12/20/87	39	63	.00	.00				
12/21/87	46	54	.30	.00				
12/22/87	26	46	.00	.00				
12/23/87	26	54	.06	.00				
12/24/87	32	58	.00	.00				
12/25/87	46	65	.00	.00				
12/26/87	35	56	.00	.00				
12/27/87	29	42	.00	.00				
12/28/87	34	36	.48	.00				
12/29/87	32	36	.44	.00				
12/30/87	18	38	.04	.00				
12/31/87	20	46	.00	.00				
1/ 1/88	35	52	.00	.00				
1/ 2/88	16	35	.00	.00				
1/ 3/88	14	32	.00	.00				
1/ 4/88	19	40	.28	.00				
1/ 5/88	12	21	.00	.00				
1/ 6/88	9	26	.00	.00				
1/ 7/88	10	25	.00	.00	17.0	18.5		
1/ 8/88	17	33	.00	.00				
1/ 9/88	15	38	.00	.00				
1/10/88	6	42	.00	.00				
1/11/88	3	39	.00	.00				
1/12/88	8	38	.00	.00				
1/13/88	24	45	.00	.00			8.6	11.8

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
1/14/88	9	28	.00	.00	16.3	18.0		
1/15/88	10	34	.00	.00				
1/16/88	8	47	.00	.00				
1/17/88	26	50	.00	.00				
1/18/88	35	52	.22	.00				
1/19/88	32	48	.00	.00				
1/20/88	36	40	1.13	.00			13.2	14.5
1/21/88	38	50	.00	.00				
1/22/88	35	37	.00	.00	16.9	18.3		
1/23/88	22	42	.00	.00				
1/24/88	22	52	.00	.00				
1/25/88	33	38	.25	.00				
1/26/88	18	33	.00	.00				
1/27/88	14	35	.00	.00				
1/28/88	14	38	.00	.00			10.0	15.1
1/29/88	16	37	.00	.00	16.0	17.9		
1/30/88	19	52	.00	.00				
1/31/88	37	63	.00	.00				
2/ 1/88	55	71	.00	.00				
2/ 2/88	36	62	.00	.00				
2/ 3/88	30	36	.55	.00				
2/ 4/88	34	44	.27	.00	16.7	18.0	8.6	11.8
2/ 5/88	24	44	.00	.00				
2/ 6/88	10	30	.00	.00				
2/ 7/88	25	34	.00	.00				
2/ 8/88	20	44	.00	.00				
2/ 9/88	23	40	.00	.00				
2/10/88	26	52	.00	.00				
2/11/88	28	44	.00	.00	16.8	18.5	11.0	11.8
2/12/88	36	40	.92	.00				
2/13/88	18	33	.02	.00				
2/14/88	20	49	.00	.00				
2/15/88	34	52	.00	.00				
2/16/88	36	48	.30	.00				
2/17/88	25	58	.00	.00				
2/18/88	30	60	.00	.00	16.5	18.2		
2/19/88	36	48	.00	.00				
2/20/88	38	58	.00	.00				
2/21/88	44	62	.00	.00				
2/22/88	20	52	.00	.00			12.8	12.5
2/23/88	46	66	.00	.00				
2/24/88	32	42	.38	.00				
2/25/88	24	40	.00	.00				
2/26/88	22	45	.00	.00	16.8	18.5		
2/27/88	33	47	.00	.00				
2/28/88	33	50	.00	.00				
2/29/88	25	56	.03	.00				
3/ 1/88	25	52	.00	.00				
3/ 2/88	24	64	.00	.00				
3/ 3/88	46	62	.00	.00	16.4	18.1		
3/ 4/88	43	56	.00	.00				
3/ 5/88	30	52	.00	.00				
3/ 6/88	31	61	.00	.00				
3/ 7/88	31	65	.00	.00			11.4	12.6
3/ 8/88	30	63	.84	.00				
3/ 9/88	38	66	.00	.00				
3/10/88	43	58	.01	.00	16.5	17.9		
3/11/88	28	68	.08	.00				
3/12/88	52	77	.00	.00				
3/13/88	38	70	.00	.00				
3/14/88	31	72	.08	.00				
3/15/88	26	35	.00	.00				
3/16/88	26	51	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
3/17/88	34	72	.00	.00	14.9	18.5		
3/18/88	31	48	.00	.00				
3/19/88	36	56	.00	.00				
3/20/88	38	58	.00	.00				
3/21/88	28	50	.25	.25				
3/22/88	21	54	.00	.00				
3/23/88	33	65	.00	.00				
3/24/88	52	82	.00	.00				
3/25/88	54	83	.00	.00	15.5	17.5		
3/26/88	52	59	.00	.00				
3/27/88	50	61	1.75	.00				
3/28/88	31	66	.00	.00			9.2	13.6
3/29/88	37	78	.00	.00				
3/30/88	42	78	.00	.00				
3/31/88	53	73	.00	.00	15.0	18.1	8.8	10.8
4/ 1/88	52	80	.03	.00				
4/ 2/88	55	80	.00	.00				
4/ 3/88	53	79	.00	.00				
4/ 4/88	60	81	.02	.00			7.2	10.6
4/ 5/88	58	85	.00	.00				
4/ 6/88	53	84	.00	.00				
4/ 7/88	47	48	.44	.00	17.7	18.8		
4/ 8/88	46	50	.92	.00				
4/ 9/88	40	65	.00	.00				
4/10/88	35	62	.00	.00				
4/11/88	46	72	.00	.00				
4/12/88	44	48	.00	.00				
4/13/88	34	64	.00	.00				
4/14/88	33	62	.00	.00	15.7	19.1		
4/15/88	36	73	.00	.00				
4/16/88	33	54	.00	.00				
4/17/88	36	68	.00	.00				
4/18/88	54	63	.00	.00				
4/19/88	35	56	.15	.00				
4/20/88	33	68	.00	.00				
4/21/88	46	68	.00	.00				
4/22/88	46	70	.00	.00				
4/23/88	42	65	.00	.00				
4/24/88	45	59	.00	.00				
4/25/88	38	72	.00	.00				
4/26/88	38	75	.00	.00				
4/27/88	46	76	.00	.00				
4/28/88	40	61	.46	.00	16.5	18.3		
4/29/88	42	64	.00	.00				
4/30/88	47	71	.00	.00				
5/ 1/88	40	79	.00	.00				
5/ 2/88	44	66	.00	.00				
5/ 3/88	44	63	.07	.00				
5/ 4/88	48	62	.00	.00				
5/ 5/88	52	63	.83	.00	16.2	17.5		
5/ 6/88	55	88	.94	.00				
5/ 7/88	48	80	.00	.00				
5/ 8/88	50	81	.00	.00				
5/ 9/88	58	80	.00	.00				
5/10/88	58	84	.25	.00				
5/11/88	56	81	.26	.00				
5/12/88	57	83	.00	.00	15.8	18.4		
5/13/88	65	88	.00	.00				
5/14/88	58	89	.00	.00				
5/15/88	60	84	.00	.00				
5/16/88	56	86	.00	.00				
5/17/88	61	82	1.20	.00				
5/18/88	59	72	.75	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
5/19/88	59	76	1.13	.00	17.0	18.8		
5/20/88	60	89	.04	.00				
5/21/88	61	88	.17	.00				
5/22/88	53	82	.00	.00				
5/23/88	64	93	.00	.00				
5/24/88	61	91	.85	.00				
5/25/88	54	66	.25	.00				
5/26/88	52	78	.08	.00	14.7	18.8		
5/27/88	43	78	.00	.00				
5/28/88	48	83	.00	.00				
5/29/88	51	86	.00	.00				
5/30/88	55	89	.00	.00				
5/31/88	61	98	.00	.00				
6/ 1/88	63	97	.13	.00				
6/ 2/88	57	70	.03	.00	17.1	18.9	8.5	11.6
6/ 3/88	52	92	.00	.00				
6/ 4/88	49	78	.00	.00				
6/ 5/88	45	89	.00	.00				
6/ 6/88	65	94	.00	.00				
6/ 7/88	72	100	.00	.00				
6/ 8/88	65	90	.00	.00				
6/ 9/88	55	58	.04	.00	17.0	19.0		
6/10/88	55	78	.30	.00				
6/11/88	48	86	.00	.00				
6/12/88	52	88	.00	.00				
6/13/88	60	99	.00	.00				
6/14/88	60	100	.00	.00				
6/15/88	63	101	.00	.00				
6/16/88	70	96	.20	.00	17.6	19.4		
6/17/88	70	87	.00	.00				
6/18/88	68	97	.00	.00				
6/19/88	70	98	.00	.00				
6/20/88	65	102	.00	.00				
6/21/88	70	106	.00	.00				
6/22/88	70	107	.00	.00				
6/23/88	72	102	.00	.00	15.3	18.3		
6/24/88	74	106	.00	.00				
6/25/88	63	91	.00	.00				
6/26/88	73	102	.00	.00				
6/27/88	66	88	.00	.00				
6/28/88	64	89	.00	.00				
6/29/88	58	86	.00	.00				
6/30/88	55	81	.00	.00	16.7	20.1		
7/ 1/88	58	84	.00	.00				
7/ 2/88	50	92	.00	.00				
7/ 3/88	58	88	.00	.00				
7/ 4/88	64	101	.00	.00				
7/ 5/88	63	96	.00	.00				
7/ 6/88	64	102	.00	.00				
7/ 7/88	72	104	.00	.00	16.6	18.6		12.2
7/ 8/88	72	103	.00	.00				
7/ 9/88	73	104	.00	.00				
7/10/88	70	106	.00	.00				
7/11/88	70	102	.07	.00				
7/12/88	71	86	.00	.00				
7/13/88	70	96	.05	.00				
7/14/88	70	102	.00	.00	17.5	18.6		
7/15/88	78	105	.00	.00				
7/16/88	72	102	.00	.00				
7/17/88	80	104	.07	.00				
7/18/88	74	100	.86	.00				
7/19/88	72	100	.08	.00				
7/20/88	74	96	.48	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
7/21/88	73	92	.00	.00	16.6	17.9		
7/22/88	69	98	.00	.00				
7/23/88	72	82	.00	.00				
7/24/88	68	99	.00	.00				
7/25/88	65	92	.84	.00				
7/26/88	73	92	.00	.00				
7/27/88	68	88	1.17	.00				
7/28/88	70	93	.00	.00	15.1	18.5		
7/29/88	69	103	.00	.00				
7/30/88	72	104	.00	.00				
7/31/88	72	102	.00	.00				
8/ 1/88	72	102	.00	.00				
8/ 2/88	72	102	.00	.00			9.0	
8/ 3/88	73	98	.00	.00				
8/ 4/88	72	96	.00	.00	16.3	18.4		
8/ 5/88	74	100	.00	.00				
8/ 6/88	72	100	.18	.00				
8/ 7/88	73	101	.00	.00				
8/ 8/88	68	100	.00	.00				
8/ 9/88	68	100	.00	.00				
8/10/88	73	102	.00	.00				
8/11/88	70	97	.00	.00	17.2	20.1		
8/12/88	76	108	.00	.00				
8/13/88	77	108	.00	.00				
8/14/88	79	109	.00	.00				
8/15/88	76	108	.50	.00				
8/16/88	67	100	.00	.00				
8/17/88	67	106	.07	.00				
8/18/88	73	95	.12	.00	16.6			
8/19/88	64	80	.00	.00				
8/20/88	68	71	.00	.00				
8/21/88	69	90	1.00	.00				
8/22/88	57	86	.00	.00				
8/23/88	64	78	.00	.00				
8/24/88	65	94	.16	.00				
8/25/88	61	90	.24	.00	17.7	18.6		
8/26/88	60	100	.00	.00				
8/27/88	56	100	.00	.00			7.5	
8/28/88	72	86	.00	.00				
8/29/88	62	78	.08	.00				
8/30/88	66	82	.93	.00				
8/31/88	56	86	.00	.00				
9/ 1/88	57	88	.00	.00	16.3	18.9		
9/ 2/88	55	90	.00	.00				
9/ 3/88	68	91	.00	.00				
9/ 4/88	59	78	.00	.00				
9/ 5/88	65	82	.00	.00				
9/ 6/88	50	77	.70	.00				
9/ 7/88	47	80	.00	.00				
9/ 8/88	43	83	.00	.00	16.9	19.3		
9/ 9/88	47	88	.00	.00				
9/10/88	64	90	.00	.00				
9/11/88	58	93	.00	.00				
9/12/88	53	82	.04	.00				
9/13/88	68	95	.00	.00				
9/14/88	59	85	.00	.00				
9/15/88	54	83	.00	.00	17.5	20.2		
9/16/88	48	81	.00	.00				
9/17/88	56	73	.00	.00				
9/18/88	62	89	.00	.00				
9/19/88	62	90	.16	.00			9.6	
9/20/88	62	84	.00	.00				
9/21/88	60	82	.10	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
9/22/88	56	81	.00	.00	16.1	18.7		
9/23/88	56	99	.00	.00				
9/24/88	63	72	.00	.00				
9/25/88	51	60	.00	.00				
9/26/88	52	82	.90	.00				
9/27/88	50	81	.00	.00				
9/28/88	52	87	.00	.00				
9/29/88	57	60	.00	.00	17.1	19.3		
9/30/88	58	80	.00	.00				
10/ 1/88	57	83	.00	.00				
10/ 2/88	60	84	.00	.00				
10/ 3/88	60	66	.65	.00				
10/ 4/88	58	72	.13	.00				
10/ 5/88	47	69	.00	.00				
10/ 6/88	38	68	.00	.00	14.7	19.2		
10/ 7/88	36	59	.00	.00				
10/ 8/88	34	63	.00	.00				
10/ 9/88	32	68	.00	.00				
10/10/88	42	62	.00	.00				
10/11/88	42	68	.00	.00				
10/12/88	38	60	.00	.00				
10/13/88	32	53	.00	.00	16.7	18.4		
10/14/88	27	67	.00	.00				
10/15/88	37	81	.00	.00				
10/16/88	42	81	.00	.00				
10/17/88	45	78	.00	.00				
10/18/88	56	66	.00	.00				
10/19/88	46	64	.00	.00				
10/20/88	36	65	.00	.00				
10/21/88	38	50	.00	.00				
10/22/88	40	67	.00	.00				
10/23/88	45	65	.00	.00				
10/24/88	46	65	1.48	.00	16.4	18.3		
10/25/88	35	66	.00	.00				
10/26/88	37	58	.00	.00				
10/27/88	28	59	.00	.00	16.9	19.1		
10/28/88	38	71	.00	.00				
10/29/88	32	60	.00	.00				
10/30/88	39	56	.00	.00				
10/31/88	27	51	.00	.00				
11/ 1/88	42	50	.73	.00				
11/ 2/88	36	52	.00	.00				
11/ 3/88	38	63	.00	.00				
11/ 4/88	42	70	.00	.00	14.7	18.5		
11/ 5/88	58	67	.00	.00				
11/ 6/88	44	64	.00	.00				
11/ 7/88	47	54	.73	.00				
11/ 8/88	42	58	.00	.00				
11/ 9/88	38	60	.00	.00				
11/10/88	40	60	.00	.00				
11/11/88	45	56	.00	.00				
11/12/88	27	53	.00	.00				
11/13/88	43	65	.00	.00				
11/14/88	34	65	.30	.00				
11/15/88	33	64	.00	.00				
11/16/88	42	67	.00	.00				
11/17/88	50	58	.84	.00		17.8		
11/18/88	34	57	.00	.00				
11/19/88	30	46	.00	.00				
11/20/88	39	56	.00	.00				
11/21/88	34	56	.97	.00				
11/22/88	28	50	.00	.00				
11/23/88	25	57	.00	.00		18.8		

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
11/24/88	27	50	.00	.00				
11/25/88	24	53	.00	.00				
11/26/88	27	60	.00	.00				
11/27/88	54	66	.00	.00				
11/28/88	43	53	1.55	.00				
11/29/88	33	50	.00	.00				
11/30/88	31	53	.00	.00				
12/ 1/88	34	51	.00	.00		20.2		
12/ 2/88	29	47	.00	.00				
12/ 3/88	27	64	.00	.00				
12/ 4/88	24	45	.00	.00				
12/ 5/88	30	53	.00	.00				
12/ 6/88	27	60	.00	.00				
12/ 7/88	29	58	.00	.00				11.3
12/ 8/88	36	51	.00	.00				
12/ 9/99	34	35	.00	.00		18.8		
12/10/88	18	35	.00	.00				
12/11/88	20	30	.00	.00				
12/12/88	17	23	1.25	.00				
12/13/88	5	26	.00	.00				
12/14/88	18	46	.00	.00				
12/15/88	38	50	.00	.00				
12/16/88	20	32	.00	.00		19.3		
12/17/88	20	32	.00	.00				
12/18/88	18	32	.00	.00				
12/19/88	25	50	.00	.00				
12/20/88	26	68	.00	.00				
12/21/88	50	52	.00	.00				
12/22/88	27	45	.10	.00		18.9		
12/23/88	30	40	.00	.00				
12/24/88	20	58	.00	.00				
12/25/88	40	52	.00	.00				
12/26/88	25	42	.00	.00				
12/27/88	30	46	.00	.00				
12/28/88	40	70	.00	.00				
12/29/88	22	35	.00	.00				
12/30/88	24	39	.00	.00				
12/31/88	23	43	.00	.00				
1/ 1/89	31	33	.00	.00				
1/ 2/89	31	34	.00	.00				
1/ 3/89	26	42	1.12	.00				
1/ 4/89	30	33	.00	1.00				
1/ 5/89	16	34	.00	.00				
1/ 6/89	29	34	.00	5.00				
1/ 7/89	30	33	.00	.00				
1/ 8/89	30	43	.00	.00				
1/ 9/89	34	38	.50	.00				
1/10/89	32	37	.00	.00				
1/11/89	25	50	.00	.00				
1/12/89	36	44	.46	.00		18.7		
1/13/89	36	40	.00	.00				
1/14/89	18	36	.00	.00				
1/15/89	32	48	.00	.00				
1/16/89	36	46	.00	.00				
1/17/89	28	51	.00	.00				
1/18/89	26	55	.00	.00				
1/19/89	26	59	.00	.00				
1/20/89	30	41	.00	.00		18.2		
1/21/89	20	33	.00	.00				
1/22/89	18	46	.00	.00				
1/23/89	25	55	.00	.00				
1/24/89	24	61	.00	.00				
1/25/89	41	46	.00	.00				

Table 22. Phase 1 environmental history (continued).

Date	Min. Temp. F	Max. Temp. F	Rain in.	Snow in.	Avg. Moist. Lane 1 %	Avg. Moist. Lane 2 %	Subgrade Modulus Lane 1 ksi	Subgrade Modulus Lane 2 ksi
1/26/89	38	50	.00	.00				
1/27/89	38	58	.12	.00		17.8		
1/28/89	29	53	.00	.00				
1/29/89	30	62	.00	.00				
1/30/89	42	56	.00	.00				
1/31/89	31	58	.00	.00				
2/ 1/89	40	73	.00	.00				
2/ 2/89	38	64	.00	.00				10.6
2/ 3/89	32	46	.00	.00				
2/ 4/89	20	32	.00	.00				
2/ 5/89	27	33	.00	.00				
2/ 6/89	32	52	.56	.00				
2/ 7/89	30	40	.00	.00				
2/ 8/89	23	40	.00	.00				
2/ 9/89	17	26	.00	.00		18.3		
2/10/89	16	35	.00	.00				
2/11/89	18	50	.00	.00				
2/12/89	20	47	.00	.00				
2/13/89	24	32	.24	.00				
2/14/89	34	53	.52	.00				
2/15/89	45	67	.07	.00				
2/16/89	32	42	.28	.00		18.9		
2/17/89	28	37	.00	.00				
2/18/69	23	51	.00	.00				
2/19/89	30	54	.00	.00				
2/20/89	32	51	.00	.00				
2/21/89	39	52	.06	.00				
2/22/89	41	46	1.05	.00				
2/23/89	20	33	.22	.00		19.8		

Table 23. Lane 1 reference location NDT data.

Test No.	Date	Temp (F)	AC (in)	CAB (in)	Load (lb)	Measured Deflections (mils)						Radial Offsets (in)							Subgrade Modulus (ksi)	
						1	2	3	4	5	6	1	2	3	4	5	6	SN	d_0	d_6
1	8/27/87	110.9	5.0	5.0	8445	67.60	50.00	38.10	21.60	8.10	2.90	.00	8.30	13.00	20.10	31.90	50.00	1.78	4.5	16.1
2	10/29/87	72.2	5.0	5.0	7621	24.60	20.40	17.70	12.80	7.20	2.80	.00	8.30	13.00	20.10	31.90	50.00	2.56	10.0	15.0
3	10/29/87	72.2	5.0	5.0	10608	38.60	32.10	28.20	20.90	12.00	4.70	.00	8.30	13.00	20.10	31.90	50.00	2.56	8.5	12.5
4	1/13/88	44.4	5.0	5.0	8857	22.90	20.20	17.00	14.20	8.90	3.90	.00	8.30	13.00	20.10	31.90	50.00	3.45	8.5	12.5
5	1/13/88	44.4	5.0	5.0	13183	36.30	31.70	27.40	23.10	15.20	6.50	.00	8.30	13.00	20.10	31.90	50.00	3.45	8.0	11.2
6	1/20/88	49.6	5.0	5.0	12462	42.95	37.95	31.55	27.75	17.70	7.70	.00	8.30	14.60	20.10	29.50	47.60	3.29	6.0	9.4
7	1/28/88	32.4	5.0	5.0	12290	32.93	29.30	25.50	22.75	16.03	8.13	.00	8.30	14.60	20.10	31.90	50.00	3.80	7.0	8.3
8	2/ 4/88	47.0	5.0	5.0	12428	42.93	38.00	31.97	28.23	18.53	8.50	.00	8.30	14.60	20.10	31.90	50.00	3.37	5.5	8.1
9	2/11/88	49.1	5.0	5.0	11535	41.60	36.23	30.70	25.93	16.27	6.90	.00	8.30	14.60	20.10	31.90	50.00	3.31	5.5	9.2
10	2/22/88	54.4	5.0	5.0	11329	45.47	39.10	33.20	27.57	17.03	7.00	.00	8.30	14.60	20.10	31.90	50.00	3.14	5.0	8.9
11	3/ 7/88	80.2	5.0	5.0	11329	63.93	53.43	42.03	33.00	17.50	6.00	.00	8.30	14.60	20.10	31.90	50.00	2.28	5.0	10.4
12	6/ 2/88	77.2	5.0	5.0	10814	69.30	60.70	46.03	40.03	21.73	6.57	.00	8.30	14.60	20.10	31.90	50.00	2.39	4.0	9.1
13	9/19/88	88.7	5.0	5.0	8376	73.86	62.17	41.73	32.43	14.10	3.67	.00	8.30	14.60	20.10	31.90	50.00	1.99	3.5	12.6
14	8/27/87	110.9	4.5	5.0	8445	63.00	45.30	33.70	18.70	7.80	3.20	.00	8.30	13.00	20.10	31.90	50.00	1.67	5.5	14.6
15	10/29/87	72.2	4.5	5.0	7724	23.70	19.30	16.30	11.40	6.20	2.40	.00	8.30	13.00	20.10	31.90	50.00	2.38	12.0	17.6
16	10/29/87	72.2	4.5	5.0	10608	37.60	30.70	26.50	18.90	10.40	4.20	.00	8.30	13.00	20.10	31.90	50.00	2.38	9.5	13.9
17	1/13/88	44.4	4.5	5.0	9269	25.10	21.20	18.30	13.90	8.00	3.30	.00	8.30	13.00	20.10	31.90	50.00	3.18	9.0	15.5
18	1/13/88	44.4	4.5	5.0	12565	39.50	33.10	29.00	22.50	13.20	5.50	.00	8.30	13.00	20.10	31.90	50.00	3.18	7.0	12.6
19	1/20/88	49.6	4.5	5.0	12565	43.30	37.35	30.00	25.65	15.40	6.10	.00	8.30	14.60	20.10	29.50	47.60	3.03	7.0	12.0
20	1/28/88	32.4	4.5	5.0	12565	29.93	26.80	21.93	19.90	13.33	6.50	.00	8.30	14.60	20.10	31.90	50.00	3.49	9.5	10.7
21	2/ 4/88	47.0	4.5	5.0	12324	44.97	39.17	31.70	27.53	17.13	7.17	.00	8.30	14.60	20.10	31.90	50.00	3.10	6.0	9.5
22	2/11/88	49.1	4.5	5.0	11535	43.73	37.70	30.43	25.47	15.13	6.00	.00	8.30	14.60	20.10	31.90	50.00	3.05	5.5	10.6
23	2/22/88	54.4	4.5	5.0	11192	48.50	41.20	33.23	27.23	15.90	6.03	.00	8.30	14.60	20.10	31.90	50.00	2.90	5.0	10.2
24	3/ 7/88	80.2	4.5	5.0	11329	69.13	56.57	42.70	32.17	15.90	5.20	.00	8.30	14.60	20.10	31.90	50.00	2.12	5.0	12.0
25	3/28/88	76.5	4.5	5.0	8205	68.10	50.77	39.27	27.00	12.93	4.03	.00	8.30	14.60	20.10	31.90	50.00	2.24	3.0	11.2
26	8/27/87	110.9	4.0	8.5	8445	50.80	36.70	27.60	15.90	7.10	3.00	.00	8.30	13.00	20.10	31.90	50.00	2.05	6.5	15.5
27	8/27/87	110.9	4.0	8.5	12359	80.00	59.90	46.40	28.10	12.60	5.20	.00	8.30	13.00	20.10	31.90	50.00	2.05	6.0	13.1
28	10/29/88	72.2	4.0	8.5	7621	20.10	16.40	13.50	9.70	5.40	2.50	.00	8.30	13.00	20.10	31.90	50.00	2.68	15.0	16.8
29	10/29/88	72.2	4.0	8.5	10505	32.10	26.20	22.40	16.00	9.20	4.20	.00	8.30	13.00	20.10	31.90	50.00	2.68	11.5	13.8
30	1/13/88	44.4	4.0	8.5	8857	22.00	18.80	16.50	12.60	7.90	3.80	.00	8.30	13.00	20.10	31.90	50.00	3.39	10.5	12.9
31	1/20/88	44.4	4.0	8.5	12874	33.50	28.60	25.40	19.80	12.60	6.30	.00	8.30	13.00	20.10	31.90	50.00	3.39	9.5	11.3
32	1/20/88	49.6	4.0	8.5	12119	44.57	37.83	33.33	25.47	15.40	6.77	.00	8.30	14.60	20.10	29.50	47.60	3.26	6.0	10.4
33	1/28/88	32.4	4.0	8.5	12393	29.30	25.70	22.97	18.83	12.73	6.63	.00	8.30	14.60	20.10	31.90	50.00	3.67	10.0	10.3
34	2/ 4/88	47.0	4.0	8.5	12325	45.73	39.27	34.57	27.20	17.23	8.03	.00	8.30	14.60	20.10	31.90	50.00	3.33	6.0	8.5
35	2/11/88	49.1	4.0	8.5	11501	43.40	36.83	32.07	24.57	15.03	6.70	.00	8.30	14.60	20.10	31.90	50.00	3.28	5.5	9.5
36	3/28/88	77.7	4.0	8.5	9132	58.97	46.90	38.07	25.83	12.67	4.83	.00	8.30	14.60	20.10	31.90	50.00	2.53	4.0	10.4
37	3/31/88	84.7	4.0	8.5	9029	62.10	48.83	38.96	25.83	12.60	4.73	.00	8.30	14.60	20.10	31.90	50.00	2.33	4.0	10.5
38	4/ 4/88	86.0	4.0	8.5	8823	53.27	42.83	34.57	24.47	12.60	4.90	.00	8.30	14.60	20.10	31.90	50.00	2.29	5.0	9.9
39	6/ 2/88	77.2	4.0	8.5	9441	71.87	58.53	47.87	34.33	18.27	6.83	.00	8.30	14.60	20.10	31.90	50.00	2.54	3.0	7.6
40	8/ 2/88	97.0	4.0	8.5	8205	71.47	53.07	36.17	22.93	10.20	3.77	.00	8.30	14.60	20.10	31.90	50.00	2.03	3.5	12.0
41	9/19/88	88.7	4.0	8.5	10299	67.33	51.57	38.13	26.50	13.27	5.47	.00	8.30	14.60	20.10	31.90	50.00	2.22	5.0	10.4

Table 24. Lane 2 reference location NDT data.

Test No.	Date	Temp (F)	AC (in)	CAB (in)	Load (lb)	Measured Deflections (mils)						Radial Offsets (in)							Subgrade Mosulus (ksi)	
						1	2	3	4	5	6	1	2	3	4	5	6	SN	d_0	d_6
1	10/29/87	57.1	6.5	11.0	8445	10.10	8.50	7.50	5.90	4.00	2.20	.0	8.3	13.0	20.1	31.9	50.0	4.61	27.0	21.1
2	10/29/87	57.1	6.5	11.0	11226	15.60	13.40	12.00	9.50	6.50	3.50	.0	8.3	13.0	20.1	31.9	50.0	4.61	20.5	17.7
3	1/13/88	35.3	6.5	11.0	9681	11.50	10.00	9.10	7.50	5.50	3.30	.0	8.3	14.6	20.1	31.9	50.0	5.46	18.0	16.2
4	1/13/88	35.3	6.5	11.0	13183	17.30	15.20	14.10	11.60	8.50	5.10	.0	8.3	14.6	20.1	31.9	50.0	5.46	15.0	14.3
5	1/20/88	45.6	6.5	11.0	12496	19.23	17.27	14.37	13.17	9.43	5.10	.0	8.3	14.6	20.1	29.5	47.6	5.07	13.5	14.2
6	1/28/88	32.6	6.5	11.0	12256	14.26	13.03	11.07	10.43	7.90	4.73	.0	8.3	14.6	20.1	31.9	50.0	5.56	17.5	14.3
7	2/ 4/88	43.5	6.5	11.0	12720	19.75	17.25	15.70	13.05	9.45	5.60	.0	8.3	14.6	20.1	31.9	50.0	5.15	12.5	12.5
8	2/11/88	42.4	6.5	11.0	11947	18.03	15.63	14.20	11.67	8.33	4.87	.0	8.3	14.6	20.1	31.9	50.0	5.19	13.0	13.5
9	2/22/88	44.2	6.5	11.0	11329	17.90	15.63	13.90	11.47	8.13	4.73	.0	8.3	14.6	20.1	31.9	50.0	5.12	12.5	13.2
10	3/ 7/88	73.8	6.5	11.0	11741	23.33	19.60	17.03	13.23	8.90	4.80	.0	8.3	14.6	20.1	31.9	50.0	3.89	16.5	13.5
11	3/28/88	74.6	6.5	11.0	9681	20.13	16.47	13.00	10.77	6.87	3.53	.0	8.3	14.6	20.1	31.9	50.0	3.85	15.5	15.1
12	3/31/88	81.6	6.5	11.0	9475	23.70	18.97	15.10	11.77	7.00	3.57	.0	8.3	14.6	20.1	31.9	50.0	3.53	14.0	14.6
13	4/ 4/88	85.9	6.5	11.0	9132	19.67	16.03	13.33	10.33	6.50	3.40	.0	8.3	14.6	20.1	31.9	50.0	3.34	22.0	14.8
14	2/ 2/89	51.6	6.5	11.0	11810	20.50	18.00	16.37	13.30	8.90	4.57	.0	8.3	14.6	20.1	31.9	50.0	4.83	12.0	14.3
15	10/29/87	57.1	7.5	11.0	8754	7.70	6.70	6.00	5.00	3.70	2.20	.0	8.3	13.0	20.1	31.9	50.0	5.08	42.0	22.0
16	10/29/87	57.1	7.5	11.0	11844	11.70	10.20	9.30	7.70	5.60	3.50	.0	8.3	13.0	20.1	31.9	50.0	5.08	33.0	18.7
17	1/13/88	35.3	7.5	11.0	9990	8.40	7.60	6.80	6.10	4.80	3.10	.0	8.3	14.6	20.1	31.9	50.0	6.06	27.5	17.8
18	1/13/88	35.3	7.5	11.0	14419	12.60	11.40	10.30	9.20	7.20	4.80	.0	8.3	14.6	20.1	31.9	50.0	6.06	25.5	16.6
19	1/20/88	45.6	7.5	11.0	12393	14.67	13.20	11.80	10.60	8.20	5.20	.0	8.3	14.6	20.1	29.5	47.6	5.61	18.0	13.8
20	1/28/88	32.6	7.5	11.0	12325	11.30	10.37	9.37	8.67	6.97	4.70	.0	8.3	14.6	20.1	31.9	50.0	6.18	22.5	14.5
21	2/ 4/88	43.5	7.5	11.0	11226	13.27	12.03	10.53	9.60	7.37	4.70	.0	8.3	14.6	20.1	31.9	50.0	5.71	17.0	13.2
22	2/11/88	42.4	7.5	11.0	11878	13.67	12.30	10.93	9.80	7.43	4.73	.0	8.3	14.6	20.1	31.9	50.0	5.75	17.5	13.9
23	2/22/88	44.2	7.5	11.0	11432	13.83	12.40	10.90	9.70	7.30	4.60	.0	8.3	14.6	20.1	31.9	50.0	5.67	17.0	13.7
24	3/ 7/88	73.8	7.5	11.0	11741	19.03	16.40	13.87	11.80	8.13	4.63	.0	8.3	14.6	20.1	31.9	50.0	4.25	21.0	14.0
25	3/28/88	74.6	7.5	11.0	9750	16.77	14.10	11.67	9.60	6.33	3.53	.0	8.3	14.6	20.1	31.9	50.0	4.21	19.0	15.2
26	3/31/88	81.6	7.5	11.0	9132	19.30	16.07	12.83	10.40	6.60	3.50	.0	8.3	14.6	20.1	31.9	50.0	3.84	16.5	14.4
27	4/ 4/88	85.9	7.5	11.0	9097	16.00	13.67	11.03	9.33	6.20	3.50	.0	8.3	14.6	20.1	31.9	50.0	3.61	30.5	14.3
28	6/ 2/88	73.0	7.5	11.0	11226	25.15	22.00	18.90	15.75	10.80	5.80	.0	8.3	14.6	20.1	31.9	50.0	4.29	11.0	10.7
29	7/ 7/88	105.7	7.5	11.0	9338	30.23	23.23	17.77	12.80	7.13	3.70	.0	8.3	14.6	20.1	31.9	50.0	3.01	15.5	13.9
30	10/29/87	57.1	7.5	14.0	8960	8.20	7.20	6.50	5.50	4.10	2.50	.0	8.3	13.0	20.1	31.9	50.0	5.50	42.5	19.8
31	10/29/87	57.1	7.5	14.0	11329	12.30	10.90	10.00	8.40	6.20	3.60	.0	8.3	13.0	20.1	31.9	50.0	5.50	29.0	17.4
32	1/13/88	35.3	7.5	14.0	10299	9.20	8.30	7.60	6.90	5.40	3.50	.0	8.3	14.6	20.1	31.9	50.0	6.48	25.5	16.2
33	1/13/88	35.3	7.5	14.0	13904	13.70	12.60	11.70	10.60	8.40	5.50	.0	8.3	14.6	20.1	31.9	50.0	6.48	21.0	14.0
34	1/20/88	45.6	7.5	14.0	12668	16.33	14.73	13.30	11.90	9.07	5.50	.0	8.3	14.6	20.1	29.5	47.6	6.03	15.5	13.4
35	1/28/88	32.6	7.5	14.0	12496	13.03	12.93	10.97	10.07	8.07	5.40	.0	8.3	14.6	20.1	31.9	50.0	6.60	18.0	12.8
36	2/ 4/88	43.5	7.5	14.0	11329	14.83	13.40	12.10	11.03	8.50	5.30	.0	8.3	14.6	20.1	31.9	50.0	6.13	14.5	11.8
37	2/11/88	42.4	7.5	14.0	11947	15.13	13.73	12.50	11.10	8.57	5.27	.0	8.3	14.6	20.1	31.9	50.0	6.17	15.0	12.5
38	2/28/88	44.2	7.5	14.0	11707	15.17	13.63	12.40	11.00	8.50	5.20	.0	8.3	14.6	20.1	31.9	50.0	6.09	14.5	12.4
39	3/ 7/88	73.8	7.5	14.0	11741	15.87	14.43	13.20	11.60	8.80	5.30	.0	8.3	14.6	20.1	31.9	50.0	4.67	32.5	12.2
40	3/28/88	74.6	7.5	14.0	9921	19.00	16.17	13.67	11.43	7.60	3.90	.0	8.3	14.6	20.1	31.9	50.0	4.63	15.5	14.0
41	3/31/88	81.6	7.5	14.0	9715	20.80	17.63	14.90	12.20	8.00	4.13	.0	8.3	14.6	20.1	31.9	50.0	4.26	16.5	13.0
42	4/ 4/88	82.4	7.5	14.0	9372	18.63	15.43	12.97	10.60	7.00	3.63	.0	8.3	14.6	20.1	31.9	50.0	4.22	20.0	14.2
43	6/ 2/88	78.0	7.5	14.0	11707	24.83	21.17	17.73	14.77	9.87	5.20	.0	8.3	14.6	20.1	31.9	50.0	4.45	14.5	12.4

APPENDIX C. LANE 1, SECTION 1 DATA

Table 25. Lane 1, section 1 loading and environemental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
3/24/88			5384				5384	5384	59.7	52	82	0
3/25/88			7145				7145	12529	59.5	54	83	0
3/26/88			0				0	12529	53.6	52	59	0
3/27/88			0				0	12529		50	61	1.75
3/28/88			0				0	12529	58.9	31	66	0
3/29/88			4877				4877	17406	58.9	37	78	0
3/30/88			4503				4503	21909	62.8	42	78	0
3/31/88			4966				4966	26875	65.6	53	73	0
4/ 1/88			7568				7568	34443	58.7	52	80	.03
4/ 2/88			2356				2356	36799	56.3	55	80	0
4/ 3/88			0				0	36799		53	79	0
4/ 4/88			234				234	37033	60.6	60	81	.02

Table 26. Lane 1, section 1 cracking history.

		Lineal Cracking, in								
Date	No. of Passes	21	25	29	33	37	41	45	49	Avg
3/24/88	0	0	0	0	0	0	0	0	0	0
3/28/88	12529	0	139	30	32	10	0	0	0	26
3/30/88	17406	12	351	172	147	31	0	77	63	107
3/31/88	21909	24	589	408	267	113	0	182	194	222
4/ 4/88	37033	141	1064	1097	896	594	137	689	767	673

		Cracking and Patching, sq. ft / 1000 sq. ft								
Date	No. of Passes	21	25	29	33	37	41	45	49	Avg
3/24/88	0	0	0	0	0	0	0	0	0	0
3/28/88	12529	0	0	0	0	0	0	0	0	0
3/30/88	17406	0	55	3	1	0	0	0	0	7
3/31/88	21909	1	181	173	21	2	0	8	3	49
4/ 4/88	37033	11	550	639	479	427	7	504	536	394

Table 27. Lane 1, section 1 rutting history.

Date	No. of Passes	Rut Depth, In								
		21	25	29	33	37	41	45	49	Avg
3/22/88	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
3/28/88	12529	.04	.33	.14	.16	.12	.06	.16	.18	.15
3/30/88	17406	.06	.57	.37	.29	.25	.08	.22	.31	.27
3/31/88	21909	.06	.74	.51	.37	.31	.10	.29	.37	.34
4/ 1/88	26875	.08	.84	.81	.39	.43	.08	.39	.47	.44
4/ 4/88	36799	.10	1.00	1.08	.43	.61	.10	.51	.67	.56

Table 28. Lane 1, section 1 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
3/22/88	0	4.35	.00	.0	3.64
3/28/88	12529	7.62	.15	.0	3.21
3/30/88	21909	24.47	.27	7.4	2.22
3/31/88	26875	36.82	.34	48.6	1.79
4/ 1/88	34443	43.48	.44	48.6	1.55
4/ 4/88	37033	57.97	.57	394.1	1.00

Table 29. Lane 1, section 1 NDT data.

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
3/10/88	0	21	63	76	9269	51.30	42.80	32.20	24.87	12.50	4.21	2.16	5.7											
		25	64	75	9303	52.30	42.63	32.40	24.63	12.20	4.23	2.14	5.6											
		28	65	75	9338	50.87	41.13	32.03	24.47	13.03	4.67	2.16	5.7											
		29	64	75	9269	46.23	37.67	31.53	23.27	12.67	4.67	2.26	6.1	52	70	11295	47.13	39.60	31.97	25.33	14.13	5.10	2.46	7.0
		33	64	74	9269	42.70	36.20	28.53	23.13	12.97	4.97	2.36	6.5											
		36	64	74	9269	41.73	34.87	28.90	22.67	12.93	4.93	2.38	6.6											
		37	65	74	9303	39.03	32.80	28.20	21.47	12.40	4.80	2.46	7.0											
		38	65	74	9269	36.50	30.97	26.90	20.13	11.63	4.67	2.54	7.3											
		41	63	73	9269	32.83	27.87	23.37	18.77	11.30	4.47	2.68	7.9	58	69	9956	40.23	34.13	28.93	23.10	13.63	5.20	2.32	6.4
		45	62	73	9269	38.87	32.77	25.77	20.63	11.27	4.33	2.46	7.0											
		49	61	73	9269	39.77	33.00	25.97	20.50	11.53	4.67	2.44	6.9											
3/28/88	12529	21	69	75	8445	55.93	47.23	32.37	25.60	11.57	3.57	1.98	5.0											
		25	68	75	8170	76.20	57.70	38.70	25.93	9.60	3.03	1.42	5.0											
		28	71	75	8205	68.10	50.77	39.27	27.00	12.93	4.03	1.58	5.0											
		29	72	76	7312	56.80	42.57	30.93	23.80	11.37	3.30	1.68	5.0	71	79	9166	52.30	43.03	35.93	26.30	13.47	4.40	2.12	5.5
		33	72	76	8239	62.03	47.93	36.67	23.87	10.77	3.97	1.74	5.0											
		36	73	77	8411	53.77	42.20	34.40	24.63	13.10	4.70	2.02	5.1											
		37	72	77	8308	51.87	40.90	33.03	24.83	13.43	4.80	2.04	5.1											
		38	72	77	8411	46.17	37.20	32.00	23.10	12.73	4.77	2.16	5.7											
		41	71	78	8445	40.07	33.37	27.63	21.93	12.73	4.67	2.32	6.4	71	78	8411	41.47	34.43	29.73	22.40	12.70	4.53	2.28	6.2
		45	72	78	8376	47.67	40.10	30.87	23.20	11.27	3.67	2.12	5.5											
		49	73	78	8342	52.87	43.47	32.90	23.00	10.47	3.83	2.02	5.1											
3/31/88	21909	21	75	77	8205	59.83	51.07	36.73	28.57	12.60	3.67	1.80	5.0											
		25	76	78	6454	77.17	61.27	33.17	16.93	6.03	2.47	1.12	5.0											
		28	72	78	6866	75.23	50.87	35.63	20.60	8.40	2.90	1.22	5.0											
		29	73	78	7072	62.93	43.23	30.30	21.47	9.47	2.83	1.48	5.0	82	84	9029	64.63	53.30	42.07	32.20	16.77	5.43	1.84	5.0
		33	75	79	7999	76.00	59.13	44.10	26.23	11.10	4.13	1.40	5.0											
		36	75	79	8273	66.90	51.77	43.17	28.47	14.63	5.07	1.62	5.0											
		37	76	79	8273	60.93	47.53	39.23	28.27	14.47	4.97	1.78	5.0											
		38	76	80	8445	56.10	44.93	39.07	27.00	14.23	5.30	1.96	5.0											
		41	76	80	9578	60.87	49.60	39.10	31.43	17.00	5.37	2.02	5.1	81	84	9200	49.50	41.73	35.37	27.67	15.67	5.67	2.18	5.8
		45	76	81	8960	73.73	63.23	46.03	33.27	13.87	4.40	1.60	5.0											
		49	77	82	9097	78.23	64.93	48.43	31.63	12.83	4.60	1.54	5.0											

Table 29. Lane 1, section 1 NDT data (continued).

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
4/ 4/88	37033	21	74	72	9372	71.33	61.83	44.57	34.00	14.23	4.00	1.72	5.0											
		25	76	74	4978	65.53	47.70	17.60	9.97	3.30	1.63	1.26	5.0											
		28	75	75	2712	28.67	21.97	6.67	2.57	1.37	.73	1.04	5.0											
		29	76	75	4669	67.90	46.13	16.93	10.60	3.53	1.60	0.96	5.0	79	84	8754	56.83	47.80	38.67	30.33	16.70	5.77	2.00	5.0
		33	78	77	6213	77.10	58.77	36.07	22.60	7.57	3.20	1.08	5.0											
		36	76	78	5253	61.33	44.70	33.47	14.03	5.47	2.17	1.16	5.0											
		37	76	79	6282	69.80	50.53	41.97	22.03	9.37	3.40	1.20	5.0											
		38	77	80	7896	71.03	54.37	50.20	25.23	13.47	4.97	1.46	5.0											
		41	77	81	9166	62.50	52.07	41.90	33.17	17.00	5.43	1.92	5.0	77	84	8960	45.53	39.30	32.83	26.97	15.93	6.07	2.24	6.0
		45	79	83	5801	69.03	57.20	37.63	23.47	6.33	2.77	1.12	5.0											
		49	79	84	5047	67.23	48.53	33.40	13.53	4.80	2.10	1.02	5.0											

APPENDIX D. LANE 1, SECTION 2 DATA

Table 30. Lane 1, section 2 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
12/14/87			1688				1688	1688	47.7	32	45	.0
12/15/87	199		200				399	2087	41.3	36	42	.7
12/16/87					344		344	2431	40.0	35	41	.0
12/17/87	170		316				486	2917	38.7	34	40	.0
12/18/87		0					0	2917		28	40	.0
12/19/87		0					0	2917		30	45	.0
12/20/87		0					0	2917		39	63	.0
12/21/87		0					0	2917		46	54	.3
12/22/87		0					0	2917		26	46	.0
12/23/87		0					0	2917		26	54	.1
12/24/87		0					0	2917		32	58	.0
12/25/87		0					0	2917		46	65	.0
12/26/87		0					0	2917		35	56	.0
12/27/87		0					0	2917		29	42	.0
12/28/87		0					0	2917		34	36	.5
12/29/87		0					0	2917		32	36	.4
12/30/87		0					0	2917		18	38	.0
12/31/87		0					0	2917		20	46	.0
1/ 1/88		0					0	2917		35	52	.0
1/ 2/88		0					0	2917		16	35	.0
1/ 3/88		0					0	2917		14	32	.0
1/ 4/88		0					0	2917		19	40	.6
1/ 5/88		0					0	2917		12	21	.0
1/ 6/88		612					612	3529	24.0	9	26	.0
1/ 7/88		2178					2178	5707	24.7	10	25	.0
1/ 8/88		0					0	5707		17	33	.8
1/ 9/88		0					0	5707		15	38	.0
1/10/88		0					0	5707		6	42	.0
1/11/88		2774					2774	8481	27.6	3	39	.0
1/12/88		0					0	8481	23.8	8	38	.0
1/13/88		0					0	8481	28.9	24	45	.0
1/14/88		2732					2732	11213	26.1	9	28	.0
1/15/88		2995					2995	14208	25.2	10	34	.0
1/16/88		0					0	14208		8	47	.0
1/17/88		0					0	14208		26	50	.0
1/18/88		7780					7780	21988	36.0	35	52	.2
1/19/88		7715					7715	29703	33.9	32	48	.0
1/20/88		6469					6469	36172	34.4	36	40	1.1
1/21/88		491					491	36663	38.4	38	50	.0
1/22/88		4212					4212	40875	36.8	35	37	.0
1/23/88		0					0	40875		22	42	.0
1/24/88		0					0	40875	36.5	22	52	.0
1/25/88		3142					3142	44017	36.3	33	38	.3
1/26/88		1404					1404	45421	34.1	18	33	.4
1/27/88		6361					6361	51782	32.5	14	35	.0
1/28/88		5381					5381	57163	27.8	14	38	.0
1/29/88		5849					5849	63012	26.8	16	37	.0
1/30/88		0					0	63012	26.1	19	52	.0
1/31/88		0					0	63012	25.9	37	63	.0
2/ 1/88		7673					7673	70685	31.8	55	71	.0
2/ 2/88		1233					1233	71918	39.2	36	62	.0
2/ 3/88		0					0	71918	45.8	30	36	.6
2/ 4/88		0					0	71918	49.6	34	44	.3
2/ 5/88		7907					7907	79825	33.4	24	44	.0
2/ 6/88		1217					1217	81042	25.4	10	30	.0
2/ 7/88		0					0	81042	24.2	25	34	.0
2/ 8/88		2920					2920	83962	30.3	20	44	.0
2/ 9/88		7051					7051	91013	31.4	23	40	.0
2/10/88		8367					8367	99380	31.0	26	52	.0
2/11/88		2753					2753	102133	32.4	28	44	.0

Table 30. Lane 1, section 2 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
2/17/88		8682					8682	143654	34.4	25	58	.0
2/18/88		4042					4042	147696	36.8	30	60	.0
2/12/88		8423					8423	110556	30.8	36	40	.9
2/13/88		8328					8328	118884	25.0	18	33	.0
2/14/88		0					0	118884	26.8	20	49	.0
2/15/88		7601					7601	126485	32.1	34	52	.0
2/16/88		8487					8487	134972	36.1	36	48	.3

Table 31. Lane 1, section 2 cracking history.

Date	No. of Passes	Lineal Cracking, in								
		62	66	70	74	78	82	86	90	Avg
12/13/87	0	0	0	0	0	0	0	0	0	0
1/ 9/88	29703	0	0	0	0	0	0	0	22	3
1/21/88	36670	0	0	0	0	0	0	13	87	12
1/27/88	45421	0	0	0	0	0	0	111	357	58
1/28/88	51781	0	0	0	0	0	0	157	512	84
2/ 1/88	65359	0	0	0	0	0	3	553	1084	205
2/ 3/88	71918	15	35	0	0	12	47	553	1084	218
2/11/88	99784	34	79	0	0	37	83	553	1084	234
2/15/88	118884	98	273	10	12	177	513	553	1084	340
2/19/88	147696	233	508	25	61	372	1007	553	1084	480

Date	No. of Passes	Cracking and Patching, sq. ft / 1000 sq. ft								
		62	66	70	74	78	82	86	90	Avg
12/13/87	0	0	0	0	0	0	0	0	0	0
1/ 9/88	29703	0	0	0	0	0	0	0	0	0
1/21/83	36670	0	0	0	0	0	0	0	0	0
1/27/88	45421	0	0	0	0	0	0	1	196	24
1/28/88	51781	0	0	0	0	0	0	3	292	37
2/ 1/88	65359	0	0	0	0	0	0	6	591	75
2/ 3/88	71918	0	0	0	0	0	0	789	861	206
2/11/88	99784	0	3	0	0	0	1	789	861	207
2/15/88	118884	40	63	0	0	50	480	789	861	285
2/19/88	147696	95	235	1	2	150	635	789	861	346

Table 32. Lane 1, section 2 rutting history.

Date	No. of Passes	Rut Depth, In								
		62	66	70	74	78	82	86	90	Avg
12/13/87	0	.00	.00	.00	.00	.00	.00	.00	.00	0
1/19/88	23007	.00	.06	.04	.06	.02	.02	.08	.12	.05
1/22/88	36663	-.02	.04	.04	.04	.00	.02	.10	.16	.05
1/27/88	45990	.00	.08	.06	.08	.04	.08	.18	.27	.10
2/ 1/88	65359	.00	.10	.08	.04	.02	.04	.27	.67	.15
2/ 9/88	85479	.00	.14	.04	.04	.04	.12	.27	.67	.17
2/15/88	118884	.02	.18	.08	.08	.06	.29	.27	.67	.21
2/18/88	145404	.02	.41	.08	.10	.04	.72	.27	.67	.29

Table 33. Lane 1, section 2 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
1/11/88	8481	1.78	.03	.0	4.18
1/22/88	40875	2.03	.05	.0	4.11
1/27/88	51782	3.43	.10	37.0	3.72
2/ 1/88	70685	12.02	.15	206.0	2.73
2/ 9/88	91013	23.20	.16	206.0	2.21
2/15/88	126485	41.00	.21	292.0	1.70
2/18/88	147696	79.28	.28	357.0	1.10

Table 34. Lane 1, section 2 NDT data.

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils Radial Offset, in											Surface Deflection, mils Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
11/30/87	0	62	53		9990	22.80	20.30	18.30	14.30	8.90	4.30	3.36	10.8											
		66	48		9990	24.10	20.70	18.70	14.80	9.60	4.50	3.26	10.4											
		70	46		12050	30.60	26.30	23.80	18.60	11.90	5.50	3.18	10.1	48		12256	29.80	26.10	24.00	19.30	12.90	6.20	3.26	10.4
		74	52		11535	28.60	24.70	22.30	17.60	11.30	5.30	3.22	10.3											
		77	46		11947	29.40	25.40	23.10	18.10	11.70	5.40	3.24	10.3											
		78	55		11844	30.90	27.20	24.70	19.30	12.10	5.40	3.14	9.9											
		79	52		11844	33.30	28.90	25.90	20.10	12.40	5.40	3.02	9.4											
		82	55		11844	38.70	33.10	29.20	22.10	13.00	5.40	2.80	8.4	48		11741	34.10	30.00	27.50	21.60	13.90	6.30	2.96	9.1
		86	55		11432	38.70	32.40	28.60	21.60	13.00	5.50	2.74	8.2											
		90	48		11535	33.20	28.00	24.80	18.70	11.10	5.00	2.98	9.2											
1/13/88	8481	62	43	38	13492	28.20	25.80	21.40	19.80	13.50	7.10	3.52	11.6											
		66	43	38	13286	30.20	26.60	24.40	20.30	14.10	7.40	3.36	10.8											
		70	44	38	13080	29.60	26.10	23.50	20.00	14.10	7.50	3.38	11.0	50	41	13801	28.70	25.70	23.60	19.90	14.10	7.40	3.52	11.6
		74	46	38	13080	30.20	26.80	23.60	20.40	14.20	7.30	3.34	10.8											
		77	48	38	13080	30.90	27.50	23.90	20.90	14.40	7.20	3.30	10.6											
		78	50	39	13389	34.70	31.20	25.30	22.80	15.10	7.40	3.14	9.9											
		79	46	39	12977	37.60	33.00	26.90	23.50	15.20	7.40	2.98	9.2											
		82	46	39	12977	39.40	34.30	28.70	24.50	15.70	7.20	2.90	8.9	49	41	12977	33.80	30.00	26.70	22.90	15.50	7.50	3.14	9.9
		86	48	39	12977	46.50	38.50	30.90	26.30	16.20	7.20	2.68	7.9											
		90	52	39	12771	49.20	42.00	34.60	27.70	14.90	6.30	2.58	7.5											
1/20/88	29703	62	50	46	11569	35.13	32.87	25.97	24.93	16.13	7.80	2.90	8.9											
		66	53	46	11089	38.17	33.30	31.43	24.67	16.53	7.80	2.72	8.1											
		70	52	46	11604	36.83	32.97	28.07	24.93	16.83	8.17	2.84	8.6	53	49	11981	33.50	29.93	26.67	22.73	15.57	7.73	3.02	9.4
		74	51	46	11226	37.67	33.30	29.50	24.67	16.33	7.70	2.76	8.3											
		77	52	46	11295	38.87	35.80	28.73	26.20	16.83	7.43	2.72	8.1											
		78	51	46	10917	44.60	40.77	30.90	28.03	17.40	7.37	2.50	7.1											
		79	51	46	12290	57.13	49.00	38.63	33.13	20.37	8.93	2.34	6.4											
		82	51	46	12393	58.43	49.93	42.07	34.87	21.30	8.30	2.32	6.4	54	49	12050	39.67	34.83	29.77	25.40	16.53	7.40	2.78	8.4
		86	52	47	11707	75.60	59.33	45.97	36.33	19.27	6.77	2.02	5.1											
		90	53	47	12187	74.93	63.27	50.07	39.30	17.30	5.67	2.06	5.2											

Table 34. Lane 1, section 2 NDT data (continued).

		Data of Test Section Centerline												Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
1/28/88	51728	62	33	34	11810	31.50	29.60	23.77	22.87	14.80	7.67	3.10	9.7											
		66	33	34	11741	34.23	29.93	28.43	22.43	15.50	7.87	2.96	9.1											
		70	33	34	11501	33.23	29.97	25.70	22.97	15.80	8.23	2.98	9.2	41	40	11432	28.10	25.20	22.47	19.40	13.67	7.00	3.24	10.3
		74	37	35	11535	33.27	29.63	25.93	22.43	15.47	7.70	2.98	9.2											
		77	33	35	11672	35.17	32.60	25.87	24.60	15.90	7.37	2.92	9.0											
		78	36	35	11295	43.87	39.77	28.97	26.13	16.03	7.37	2.56	7.4											
		79	35	35	11260	48.70	41.07	32.07	26.87	16.70	7.60	2.44	6.9											
		82	35	36	11363	51.60	41.97	33.83	28.83	17.73	7.00	2.38	6.6	43	41	11329	32.70	28.87	24.67	21.33	14.20	6.57	2.98	9.2
		86	36	36	12393	77.60	60.43	44.17	34.77	17.43	6.57	2.04	5.1											
		90	38	37	10333	77.07	67.47	43.17	29.13	11.50	4.33	1.76	5.0											
2/ 4/88	71918	62	43	43	11260	41.63	40.10	31.07	29.27	16.07	8.07	2.62	7.7											
		66	43	43	11501	45.93	39.17	36.23	28.63	19.17	9.13	2.54	7.3											
		70	43	43	11432	41.00	36.93	31.70	27.60	17.83	8.83	2.66	7.8	47	47	12565	34.43	30.70	27.63	23.53	16.37	8.20	3.06	9.6
		74	44	43	11020	40.50	35.87	31.40	26.43	17.57	8.37	2.64	7.7											
		77	42	44	11157	43.30	40.60	31.17	28.57	16.93	7.13	2.56	7.4											
		78	43	44	11054	52.13	46.60	33.97	29.30	16.80	7.07	2.34	6.4											
		79	43	46	12016	68.37	57.03	43.17	35.97	19.60	8.30	2.14	5.6											
		82	46	46	12943	72.97	60.77	51.92	39.08	22.57	9.67	2.14	5.6	46	47	12256	39.47	34.73	29.67	25.43	16.77	7.60	2.82	8.5
		86			Test Section Patched at This Location																			
		90			Test Section Patched at This Location																			
2/11/88	99380	62	48	44	12084	48.03	47.10	35.47	31.87	17.17	8.30	2.54	7.3											
		66	46	44	11947	50.40	42.03	41.13	30.33	20.07	9.17	2.46	6.8											
		70	47	44	11947	43.40	38.93	33.80	28.57	18.43	8.93	2.66	7.8	50	49	11604	31.93	28.30	25.33	21.00	14.23	6.87	3.06	9.6
		74	47	44	11775	45.37	38.87	33.73	28.10	18.63	8.57	2.58	7.5											
		77	48	44	11741	46.70	43.80	34.10	30.87	17.87	7.27	2.54	7.3											
		78	47	45	11638	56.27	50.70	37.93	30.53	16.53	6.53	2.30	6.3											
		79	48	45	11295	66.73	55.83	42.93	32.13	16.47	6.10	2.10	5.4											
		82	47	45	11466	73.25	64.10	50.15	37.73	11.63	5.93	2.02	5.1	47	49	11535	37.73	32.40	27.80	22.60	14.07	6.07	2.80	8.4
		86			Test Section Patched at This Location																			
		90			Test Section Patched at This Location																			

Table 34. Lane 1, section 2 NDT data (continued).

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E_s ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E_s ksi
2/22/88	147696	62	51	49	11741	56.90	59.30	40.70	34.03	16.00	6.73	2.30	6.3											
		66	50	49	11501	78.57	61.00	55.50	39.17	23.57	9.90	1.92	5.0											
		70	50	50	11741	46.40	41.80	36.17	31.07	18.43	8.33	2.54	7.3	57	54	11398	36.90	32.53	28.47	23.87	15.60	7.17	2.82	8.5
		74	52	51	11604	54.83	52.03	38.30	34.70	15.80	6.33	2.34	6.4											
		77	52	51	11604	54.83	52.03	38.30	34.70	15.80	6.33	2.34	6.4											
		78	52	51	11501	67.43	62.30	43.03	29.57	14.50	5.40	2.10	5.4											
		79	52	51	9921	81.23	73.43	42.97	32.43	10.77	4.27	1.62	5.0											
		82	54	51	9097	88.07	89.40	57.82	34.62	5.32	2.98	1.38	5.0	58	54	11398	42.33	36.23	31.03	25.17	15.27	6.13	2.62	7.7
		86			Test Section Patched at This Location																			
		90			Test Section Patched at This Location																			

APPENDIX E. LANE 1, SECTION 4 DATA

Table 35. Lane 1, section 4 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
3/ 1/88				7299			7299	7299	48.0	25	52	0
3/ 2/88				3152			3152	10451	33.4	24	64	0
3/ 3/88				425			425	10876	49.6	46	62	0
3/ 4/88				0			0	10876		43	56	0
3/ 5/88				0			0	10876		30	52	0
3/ 6/88				0			0	10876		31	61	0
3/ 7/88				2425			2425	13301	60.1	31	65	0
3/ 8/88				939			939	14240	43.1	30	63	.84

Table 36. Lane 1, section 4 cracking history.

Date	No. of Passes	Lineal Cracking, in								
		135	139	143	147	151	155	159	163	Avg
2/29/88	0	0	0	0	0	0	0	0	0	0
3/ 3/88	10451	0	301	468	583	245	44	229	64	242
3/ 8/88	13301	48	774	1127	1048	681	294	592	286	606
3/ 9/88	14240	93	990	1318	1179	806	426	676	402	736

Date	No. of Passes	Cracking and Patching, sq. ft / 1000 sq. ft								
		135	139	143	147	151	155	159	163	Avg
2/29/88	0	0	0	0	0	0	0	0	0	0
3/ 3/88	10451	0	99	221	314	109	0	2	0	93
3/ 8/88	13301	0	340	709	929	341	17	430	1	346
3/ 9/88	14240	1	493	713	971	411	73	476	17	394

Table 37. Lane 1, section 4 rutting history.

Date	No. of Passes	Rut Depth, In								
		135	139	143	147	151	155	159	163	Avg
2/29/88	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
3/ 3/88	10451	.16	.61	.63	.63	.37	.20	.41	.22	.40
3/ 8/88	13301	.33	.94	1.54	.74	.92	.39	.67	.41	.74
3/ 9/88	14240	.39	1.00	2.05	2.21	1.19	.43	.74	.47	1.06

Table 38. Lane 1, section 4 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
2/29/88	0	2.73	.00	.0	3.94
3/ 3/88	10876	14.72	.40	93.1	2.43
3/ 8/88	13301	39.69	.74	345.9	1.01
3/ 9/88	14240	50.39	1.06	394.5	.01

Table 39. Lane 1, section 4 NDT data.

			Data of Test Section Centerline											Data From Out of Wheelpath											
						Surface Deflection, mils											Surface Deflection, mils								
						Radial Offset, in											Radial Offset, in								
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
2/22/88	0	135	55	55	11672	51.17	44.73	37.30	31.10	19.53	8.13	2.44	6.9											
		139	55	56	11501	59.23	50.77	40.83	33.60	20.17	8.30	2.26	6.1											
		143	55	55	11157	56.40	49.73	40.80	34.43	20.97	8.40	2.28	6.2	52	53	11295	53.43	45.83	38.37	32.53	21.00	9.10	2.36	6.5
		147	55	55	11363	65.23	54.00	44.30	34.37	20.43	8.60	2.16	5.7											
		150	55	55	11123	51.53	44.20	39.87	30.83	19.83	8.77	2.38	6.6											
		151	54	55	11329	48.83	42.27	38.17	30.03	19.63	8.77	2.40	6.7											
		152	54	55	11192	46.57	40.73	36.53	29.43	19.47	8.77	2.52	7.2											
		155	54	54	11260	49.77	44.03	36.63	30.83	18.90	7.50	2.44	6.9	52	53	11295	42.17	37.77	33.20	28.40	18.93	8.50	2.64	7.7
		159	54	54	11260	59.57	49.07	39.20	30.20	16.80	6.37	2.24	6.0											
		163	54	54	11123	50.77	41.87	35.00	25.70	14.57	5.83	2.40	6.7											
3/ 7/88	10876	135	72	74	9132	65.13	55.17	42.83	34.73	18.37	5.30	1.90	5.0											
		139	69	75	8960	81.90	80.23	53.37	36.87	13.77	3.97	1.52	5.0											
		143	71	76	8376	80.07	87.23	63.20	39.27	12.27	3.60	1.48	5.0	70	80	7106	51.43	40.90	31.37	24.60	13.13	4.50	1.88	5.0
		147	72	77	7621	65.80	76.97	52.27	28.57	10.50	3.73	1.60	5.0											
		150	70	77	7209	82.90	64.57	51.13	26.37	13.07	5.30	1.26	5.0											
		151	71	77	7209	64.83	47.47	41.43	27.83	14.87	5.20	1.56	5.0											
		152	70	78	8239	60.93	48.97	44.00	30.90	16.87	5.63	1.87	5.0											
		155	71	78	8033	64.00	51.87	39.70	28.70	13.27	4.40	1.72	5.0	71	80	7690	37.23	31.43	26.50	21.03	12.10	4.47	2.34	6.4
		159	71	79	8033	77.73	58.80	41.80	26.47	11.37	4.07	1.46	5.0											
		163	73	79	8102	69.73	50.23	38.77	23.33	10.50	4.03	1.62	5.0											
3/10/88	14240	135	59	64	8102	56.87	47.60	37.00	27.57	12.03	3.97	1.94	5.0											
		139	60	65	5498	65.00	49.60	24.10	11.37	3.13	1.73	1.22	5.0											
		143			Pavement Severely Rutted									63	74	7106	40.40	32.73	24.83	19.77	10.67	3.87	2.16	5.7
		147			Pavement Severely Rutted																			
		150	60	67	7175	75.07	58.57	20.23	14.70	3.70	1.67	1.36	5.0											
		151	59	68	4910	59.47	48.37	24.03	12.97	3.73	1.77	1.20	5.0											
		152	61	69	5013	58.73	42.33	28.27	12.90	5.77	2.37	1.24	5.0											
		155	61	70	7003	52.40	42.07	29.70	18.87	7.97	3.30	1.82	5.0	65	74	7724	28.37	24.47	20.67	16.93	10.13	3.93	2.68	7.9
		159	62	70	4875	60.67	44.37	24.90	11.30	4.73	1.97	1.18	5.0											
		163	61	71	5150	51.47	34.13	23.30	8.90	4.43	1.97	1.42	5.0											

APPENDIX F. LANE 2, SECTION 1 DATA

Table 40. Lane 2, section 1 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
4/29/88				6711			6711	6711	52.9	42	64	.0
4/30/88				9076			9076	15787	55.4	47	71	.0
5/ 1/88				315			315	16102	51.2	40	79	.0
5/ 2/88				1822			1822	17924	56.8	44	66	.0
5/ 3/88				7249			7249	25173	52.3	44	63	.1
5/ 4/88				7607			7607	32780	50.1	48	62	.0
5/ 5/88				6546			6546	39326	51.9	52	63	.8
5/ 6/88				8558			8558	47884	52.2	55	88	.9
5/ 7/88				3155			3155	51039	54.1	48	80	.0
5/ 8/88				0			0	51039	52.8	50	81	.0
5/ 9/88				0			0	51039	66.8	58	80	.0
5/10/88				0			0	51039		58	84	.3
5/11/88				823			823	51862	59.9	56	81	.3
5/12/88		508		267			775	52637		57	83	.0
5/13/88		178		0			178	52815		65	88	.0
5/14/88				0			0	52815		58	89	.0
5/15/88				0			0	52815		60	84	.0
5/16/88				0			0	52815		56	86	.0
5/17/88		444		0			444	53259	68.7	61	82	1.2
5/18/88	1904			0			1904	55163		59	72	.8
5/19/88				0			0	55163		59	76	1.1
5/20/88	208	243	222	0			673	55836		60	89	.0
5/21/88				0			0	55836		61	88	.2
5/22/88				0			0	55836		53	82	.0
5/23/88				303	508	168	979	56815	70.1	64	93	.0
5/24/88		249	180	179			608	57423	74.2	61	91	.9
5/25/88		124		4065			4189	61612	57.4	54	66	.3
5/26/88				8624			8624	70236	60.6	52	78	.1
5/27/88				4974			4974	75210	63.7	43	78	.0
5/28/88				130			130	75340	64.3	48	83	.0
5/29/88				0			0	75340	65.3	51	86	.0
5/30/88				0			0	75340	67.1	55	89	.0
5/31/88				8162			8162	83502	74.2	61	98	.0
6/ 1/88				7845			7845	91347	74.1	63	97	.1
6/ 2/88				5799			5799	97146	65.2	57	70	.0
6/ 3/88				8382			8382	105528	60.5	52	92	.0
6/ 4/88				9070			9070	114598	60.5	49	78	.0
6/ 5/88				291			291	114889	60.1	45	89	.0
6/ 6/88				8125			8125	123014	70.5	65	94	.0
6/ 7/88				7410			7410	130424	76.4	72	100	.0
6/ 8/88				7290			7290	137714	74.1	65	90	.0
6/ 9/88				6865			6865	144579	60.2	55	58	.0
6/10/88				8597			8597	153176	60.1	55	78	.3
6/11/88				8748			8748	161924	65.0	48	86	.0
6/12/88				0			0	161924	62.5	52	88	.0
6/13/88				6403			6403	168327	70.1	60	99	.0
6/14/88				8362			8362	176689	73.4	60	100	.0
6/15/88				5832			5832	182521	78.8	63	101	.0
6/16/88				3186			3186	185707	79.0	70	96	.2
6/17/88				4712			4712	190419	76.6	70	87	.0
6/18/88				9092			9092	199511	76.7	68	97	.0
6/19/88				2208			2208	201719	74.5	70	98	.0
6/20/88				7059			7059	208778	87.3	65	102	.0
6/21/88				2367			2367	211145	84.8	70	106	.0
6/22/88				3933			3933	215078	86.1	70	107	.0
6/23/88				8349			8349	223427	84.6	72	102	.0
6/24/88				7904			7904	231331	78.8	74	106	.0
6/25/88				2877			2877	234208	78.0	63	91	.0
6/26/88				0			0	234208	77.3	73	102	.0
6/27/88				7831			7831	242039	78.5	66	88	.0
6/28/88				2355			2355	244394	76.4	64	89	.0

Table 40. Lane 2, section 1 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
6/29/88				3007			3007	247401	77.4	58	86	.0
6/30/88				8490			8490	255891	73.2	55	81	.0
7/ 1/88				8753			8753	264644	70.5	58	84	.0
7/ 2/88				8006			8006	272650	70.8	50	92	.0
7/ 3/88				0			0	272650	73.5	58	88	.0
7/ 4/88				0			0	272650	76.9	64	101	.0
7/ 5/88				6337			6337	278987	76.6	63	96	.0
7/ 6/88				3882			3882	282869	78.4	64	102	.0
7/ 7/88				5153			5153	288022	98.1	72	104	.0
7/ 8/88				2055			2055	290077	83.8	72	103	.0
7/ 9/88				0			0	290077	81.1	73	104	.0
7/10/88				0			0	290077	82.8	70	106	.0
7/11/88				7827			7827	297904	81.0	70	102	.1
7/12/88				5930			5930	303834	72.4	71	86	.0
7/13/88				8363			8363	312197	78.9	70	96	.1
7/14/88				3885			3885	316082	82.1	70	102	.0
7/15/88				789			789	316871	81.0	78	105	.0
7/16/88				0			0	316871		72	102	.0
7/17/88				0			0	316871		80	104	.1
7/18/88				7861			7861	324732	87.4	74	100	.9
7/19/88				7788			7788	332520	78.2	72	100	.1
7/20/88				4907			4907	337427	75.5	74	96	.5
7/21/88				2394			2394	339821	74.0	73	92	.0
7/22/88				0			0	339821		69	98	.0
7/23/88				6299			6299	346120	75.2	72	82	.0
7/24/88				9092			9092	355212	75.5	68	99	.0
7/25/88				7932			7932	363144	78.4	65	92	.8
7/26/88				8118			8118	371262	76.9	73	92	.0
7/27/88				6208			6208	377470	71.9	68	88	1.2
7/28/88				9022			9022	386492	74.5	70	93	.0
7/29/88				8165			8165	394657	79.1	69	103	.0
7/30/88				9097			9097	403754	81.9	72	104	.0
7/31/88				131			131	403885	82.1	72	102	.0
8/ 1/88				8650			8650	412535	81.7	72	102	.0
8/ 2/88				5981			5981	418516	88.3	72	102	.0
8/ 3/88				7461			7461	425977	82.5	73	98	.0
8/ 4/88				9101			9101	435078	81.4	72	96	.0
8/ 5/88				8569			8569	443647	81.5	74	100	.0
8/ 6/88				8414			8414	452061	81.0	72	100	.2
8/ 7/88				0			0	452061	73.9	73	101	.0
8/ 8/88				7038			7038	459099	83.6	68	100	.0
8/ 9/88				8805			8805	467904	80.5	68	100	.0
8/10/88				6748			6748	474652	81.2	73	102	.0
8/11/88				8907			8907	483559	82.5	70	97	.0
8/12/88				5054			5054	488613	85.8	76	108	.0
8/13/88				8138			8138	496751	87.6	77	108	.0
8/14/88				127			127	496878	82.3	79	109	.0
8/15/88				6671			6671	503549	90.8	76	108	.5
8/16/88				8710			8710	512259	80.1	67	100	.0
8/17/88				7181			7181	519440	81.4	67	106	.1
8/18/88				9034			9034	528474	78.4	73	95	.1
8/19/88				7966			7966	536440	72.8	64	80	.0
8/20/88				8053			8053	544493	67.9	68	71	.0
8/21/88				446			446	544939	66.4	69	90	1.0
8/22/88				8222			8222	553161	74.5	57	86	.0
8/23/88		61	61	6628	185		6935	560096	68.9	64	78	.0
8/24/88				8522			8522	568618	72.0	65	94	.2
8/25/88				6563			6563	575181	72.1	61	90	.2
8/26/88				8157			8157	583338	74.9	60	100	.0
8/27/88				8410			8410	591748	76.4	56	100	.0
8/28/88				5745			5745	597493	75.4	72	86	.0
8/29/88				8671			8671	606164	70.8	62	78	.1
8/30/88				8743			8743	614907	67.5	66	82	.9
8/31/88				8285			8285	623192	67.5	56	86	.0
9/ 1/88				7842			7842	631034	69.6	57	88	.0

Table 40. Lane 2, section 1 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
9/ 2/88				8536			8536	639570	69.6	55	90	.0
9/ 3/88				8485			8485	648055	70.5	68	91	.0
9/ 4/88				0			0	648055	69.1	59	78	.0
9/ 5/88				0			0	648055	69.4	65	82	.0
9/ 6/88				8117			8117	656172	66.3	50	77	.7
9/ 7/88				7479			7479	663651	66.3	47	80	.0
9/ 8/88				7712			7712	671363	63.8	43	83	.0
9/ 9/88				7356			7356	678719	66.9	47	88	.0
9/10/88				8653			8653	687372	68.6	64	90	.0
9/11/88				0			0	687372	67.2	58	93	.0
9/12/88				8457			8457	695829	71.2	53	82	.0
9/13/88				2385			2385	698214	77.9	68	95	.0
9/14/88				3026			3026	701240	72.6	59	85	.0
9/15/88				8400			8400	709640	71.0	54	83	.0
9/16/88				8514			8514	718154	63.8	48	81	.0
9/17/88				8494			8494	726648	62.4	56	73	.0
9/18/88				0			0	726648	63.9	62	89	.0
9/19/88				5961			5961	732609	73.8	62	90	.2
9/20/88				9085			9085	741694	73.1	62	84	.0
9/21/88				8144			8144	749838	68.5	60	82	.1
9/22/88				0			0	749838	63.6	56	81	.0
9/23/88				0			0	749838		56	99	.0
9/24/88				0			0	749838		63	72	.0
9/25/88				0			0	749838		51	60	.0
9/26/88				3883			3883	753721	67.8	52	82	.9
9/27/88				8378			8378	762099	64.5	50	81	.0
9/28/88				8418			8418	770517	65.2	52	87	.0
9/29/88				9075			9075	779592	60.9	57	60	.0
9/30/88				8219			8219	787811	63.0	58	80	.0
10/ 1/88				8558			8558	796369	65.7	57	83	.0
10/ 2/88				0			0	796369	66.0	60	84	.0
10/ 3/88				8706			8706	805075	61.0	60	66	.7
10/ 4/88				8603			8603	813678	57.9	58	72	.1
10/ 5/88				6470			6470	820148	57.4	47	69	.0
10/ 6/88				4866			4866	825014	56.2	38	68	.0
10/ 7/88				4240			4240	829254	53.2	36	59	.0
10/ 8/88				2790			2790	832044	52.6	34	63	.0
10/ 9/88				0			0	832044	50.6	32	68	.0
10/10/88				8355			8355	840399	58.2	42	62	.0
10/11/88				6342			6342	846741	58.7	42	68	.0
10/12/88				2857			2857	849598	54.0	38	60	.0
10/13/88				8758			8758	858356	49.9	32	53	.0
10/14/88				8378			8378	866734	48.0	27	67	.0
10/15/88				0			0	866734	54.0	37	81	.0
10/16/88				0			0	866734	58.3	42	81	.0
10/17/88				8823			8823	875557	60.6	45	78	.0
10/18/88				8715			8715	884272	57.3	56	66	.0
10/19/88				8679			8679	892951	54.8	46	64	.0
10/20/88				3650			3650	896601	51.8	36	65	.0
10/21/88				8776			8776	905377	51.6	38	50	.0
10/22/88				7254			7254	912631	51.1	40	67	.0
10/23/88				0			0	912631	51.6	45	65	.0
10/24/88				5393			5393	918024	54.6	46	65	1.5
10/25/88				9070			9070	927094	53.2	35	66	.0
10/26/88				7765			7765	934859	53.8	37	58	.0
10/27/88				8123			8123	942982	48.8	28	59	.0
10/28/88				8457			8457	951439	51.6	38	71	.0
10/29/88				8492			8492	959931	51.4	32	60	.0
10/30/88				7892			7892	967823	49.9	39	56	.0
10/31/88				0			0	967823	42.2	27	51	.0
11/ 1/88				0			0	967823		42	50	.7
11/ 2/88				247			247	968070		36	52	.0
11/ 3/88				8061			8061	976131	55.2	38	63	.0
11/ 4/88				8691			8691	984822	53.7	42	70	.0
11/ 5/88				8470			8470	993292	55.7	58	67	.0

Table 40. Lane 2, section 1 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
11/ 6/88				0			0	993292	53.2	44	64	.0
11/ 7/88				7747			7747	1001039	51.1	47	54	.7
11/ 8/88				9073			9073	1010112	47.2	42	58	.0
11/ 9/88				8600			8600	1018712	50.1	38	60	.0
11/10/88				2949			2949	1021661	47.8	40	60	.0
11/11/88				0			0	1021661		45	56	.0
11/12/88				0			0	1021661		27	53	.0
11/13/88				0			0	1021661		43	65	.0
11/14/88				5025			5025	1026686	55.6	34	65	.3
11/15/88				8340			8340	1035026	52.5	33	64	.0
11/16/88				8659			8659	1043685	54.4	42	67	.0
11/17/88				9018			9018	1052703	53.4	50	58	.8
11/18/88				8395			8395	1061098	49.6	34	57	.0
11/19/88				9066			9066	1070164	44.6	30	46	.0
11/20/88				1066			1066	1071230	44.4	39	56	.0
11/21/88				8453			8453	1079683	47.3	34	56	1.0
11/22/88				8518			8518	1088201	44.2	28	50	.0
11/23/88				3679			3679	1091880	44.3	25	57	.0
11/24/88				0			0	1091880	44.9	27	50	.0
11/25/88				0			0	1091880	45.8	24	53	.0
11/26/88				0			0	1091880	39.6	27	60	.0
11/27/88				0			0	1091880		54	66	.0
11/28/88				8231			8231	1100111		43	53	1.6
11/29/88				1428			1428	1101539	50.5	33	50	.0
11/30/88				672			672	1102211	51.1	31	53	.0
12/ 1/88				7519			7519	1109730	48.5	34	51	.0
12/ 2/88				8668			8668	1118398	43.4	29	47	.0
12/ 3/88				6987			6987	1125385	48.7	27	64	.0

Table 41. Lane 2, section 1 cracking history.

		Lineal Cracking, in								
Date	No. of Passes	21	25	29	33	37	41	45	49	Avg
4/29/88	0	0	0	0	0	0	0	0	0	0
7/11/88	290444	0	0	0	0	24	11	0	0	4
7/26/88	365144	0	17	0	0	24	11	0	0	6
8/ 8/88	452061	0	49	11	0	24	11	0	14	14
8/19/88	528706	0	87	15	0	24	11	0	14	19
8/31/88	615660	0	98	33	0	24	11	0	41	26
9/15/88	701240	0	108	62	10	24	11	0	41	32
10/ 5/88	813678	6	115	92	18	35	14	0	75	44
11/18/88	1053722	38	152	209	24	35	18	3	118	75
12/ 5/88	1125385	45	182	249	24	35	18	3	118	84

		Cracking and Patching, sq. ft / 1000 sq. ft								
Date	No. of Passes	21	25	29	33	37	41	45	49	Avg
4/29/88	0	0	0	0	0	0	0	0	0	0
7/11/88	290444	0	0	0	0	0	0	0	0	0
7/26/88	365144	0	0	0	0	0	0	0	0	0
8/ 8/88	452061	0	1	0	0	0	0	0	0	0
8/19/88	528706	0	6	0	0	0	0	0	0	1
8/31/88	615660	0	7	0	0	0	0	0	1	1
9/15/88	701240	0	7	1	0	0	0	0	1	1
10/ 5/88	813678	0	7	2	0	0	1	0	7	2
11/18/88	1053722	2	58	96	0	0	1	0	18	22
12/ 5/88	1125385	2	168	100	0	0	1	0	18	36

Table 42. Lane 2, section 1 rutting history.

Date	No. of Passes	Rut Depth, In								
		21	25	29	33	37	41	45	49	Avg
4/28/88	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
5/ 4/88	25173	.02	-.02	-.08	-.08	.02	.06	.00	.04	-.01
5/ 9/88	51039	.02	.00	-.10	-.08	.02	.06	.02	.04	.00
6/ 1/88	83778	.04	.10	.00	.00	.08	.08	.06	.10	.06
6/ 8/88	130424	.10	.18	.08	.02	.12	.12	.10	.12	.11
6/13/88	162186	.08	.16	.08	.06	.14	.12	.10	.12	.11
6/17/88	185707	.08	.16	.06	.04	.14	.12	.10	.14	.11
6/23/88	215584	.12	.22	.16	.08	.20	.16	.14	.18	.16
6/30/88	249503	.12	.25	.14	.12	.22	.16	.14	.20	.17
7/ 7/88	282807	.12	.27	.14	.12	.22	.18	.14	.20	.17
7/14/88	312197	.16	.31	.16	.12	.25	.22	.18	.22	.20
7/21/88	337828	.16	.31	.18	.14	.29	.22	.20	.25	.22
7/27/88	372853	.18	.39	.20	.16	.29	.25	.20	.25	.24
8/ 3/88	419121	.27	.45	.27	.18	.31	.27	.25	.29	.29
8/10/88	468535	.27	.49	.25	.20	.31	.25	.25	.31	.29
8/17/88	512848	.29	.49	.33	.20	.39	.33	.25	.31	.32
8/24/88	561630	.33	.51	.33	.25	.35	.33	.29	.35	.34
8/31/88	615660	.33	.49	.37	.25	.37	.35	.31	.33	.35
9/ 7/88	657307	.31	.49	.35	.25	.39	.33	.29	.35	.35
9/15/88	701240	.35	.49	.33	.20	.39	.33	.27	.33	.34
9/21/88	742113	.33	.51	.35	.22	.35	.33	.27	.33	.34
9/28/88	763814	.33	.49	.33	.22	.37	.33	.31	.33	.34
10/ 5/88	813678	.31	.27	.35	.25	.39	.35	.35	.33	.33
10/12/88	846741	.31	.47	.37	.22	.41	.33	.29	.33	.34
10/20/88	894348	.33	.49	.35	.22	.37	.37	.29	.33	.34
10/26/88	928179	.33	.51	.33	.27	.37	.35	.29	.33	.35
11/ 3/88	970391	.31	.51	.31	.22	.39	.35	.31	.31	.34
11/18/88	1053722	.33	.49	.35	.20	.37	.33	.29	.31	.33
11/23/88	1088201	.35	.45	.37	.20	.39	.33	.29	.31	.34
12/ 5/88	1125385	.33	.49	.33	.22	.35	.35	.29	.33	.34

Table 43. Lane 2, section 1 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
4/28/88	0	8.59	.00	.0	3.15
5/ 4/88	32780	7.14	.00	.0	3.29
5/ 9/88	51039	7.03	.00	.0	3.30
6/ 8/88	137714	6.10	.10	.0	3.40
6/13/88	168327	5.80	.11	.0	3.44
6/17/88	190419	6.10	.12	.0	3.40
6/23/88	223427	7.76	.16	.0	3.23
6/30/88	255891	8.12	.17	.0	3.20
7/ 7/88	288022	8.53	.18	.0	3.16
7/14/88	316082	9.20	.20	.0	3.10
7/21/88	339821	11.46	.22	.0	2.94
7/27/88	377470	20.52	.24	.0	2.48
8/ 3/88	425977	25.25	.29	.0	2.32
8/10/88	474652	25.90	.29	.0	2.30
8/17/88	519440	25.55	.32	.0	2.31
8/24/88	566618	26.96	.34	.0	2.27
8/31/88	623192	28.08	.35	1.0	2.23
9/ 7/88	663651	27.94	.35	1.0	2.24
9/15/88	709640	27.15	.34	1.0	2.26
9/21/88	749838	29.50	.34	1.0	2.19
9/28/88	770517	25.42	.34	1.0	2.31
10/ 5/88	820148	28.56	.34	2.0	2.22
10/12/88	849598	30.61	.34	2.0	2.17
10/20/88	896601	27.71	.34	2.0	2.25
10/26/88	934859	33.70	.35	2.0	2.09
11/ 3/88	976131	35.39	.34	2.0	2.05
11/18/88	1061098	42.54	.34	22.0	1.90
11/23/88	1091880	53.46	.34	30.0	1.71
12/ 5/88	1125385	61.55	.34	36.0	1.60

Table 44. Lane 2, section 1 NDT data.

			Data of Test Section Centerline			Surface Deflection, mils Radial Offset, in								Data From Out of Wheelpath			Surface Deflection, mils Radial Offset, in						
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
4/ 4/88	0	21	82	86	9132	16.90	14.10	11.17	9.43	6.20	3.53	4.32	15.0											
		25	79	86	9166	15.60	13.10	10.90	9.27	6.23	3.50	4.50	15.8											
		28	81	86	9097	16.00	13.67	11.03	9.33	6.20	3.43	4.42	15.4											
		29	81	86	9097	16.50	13.60	11.10	9.23	6.10	3.40	4.36	15.2	81	84	9166	18.47	15.37	12.53	10.43	7.00	3.83	4.16	14.3
		33	81	86	9303	16.10	13.00	10.50	8.67	5.67	3.30	4.46	15.6											
		36	81	86	9029	16.17	13.07	10.47	8.50	5.57	3.17	4.40	15.4											
		37	79	86	8994	15.50	12.60	10.43	8.37	5.50	3.10	4.48	15.7											
		38	82	86	9269	14.97	12.57	10.17	8.40	5.50	3.10	4.62	16.3											
		41	81	86	8960	16.13	12.93	10.07	8.43	5.50	3.03	4.38	15.3	79	83	9235	17.97	14.83	12.10	9.93	6.43	3.33	4.22	14.6
		42	84	86	9063	16.13	12.97	10.43	8.47	5.47	3.00	4.40	15.4											
		45	80	86	9097	15.43	12.67	9.80	8.20	5.17	2.73	4.50	15.8											
		48	83	86	9235	16.70	13.13	10.17	8.07	4.93	2.47	4.38	15.3											
6/ 2/88	91347	21	60	73	10093	21.50	18.73	15.80	13.50	9.33	5.20	4.04	13.8											
		25	61	73	10093	21.57	18.80	16.10	13.67	9.40	5.00	4.04	13.8											
		28	61	73	10745	24.07	21.10	17.97	15.03	10.30	5.53	3.94	13.4											
		29	61	73	11020	25.50	21.77	18.73	15.53	10.67	5.70	3.88	13.1	68	71	11398	13.10	11.40	9.87	8.40	5.90	3.40	5.46	20.0
		33	59	74	10951	23.23	20.07	17.13	14.23	9.50	4.97	4.06	13.9											
		36	60	75	11192	24.90	21.30	17.83	14.67	9.70	5.17	3.96	13.5											
		37	61	75	11329	23.60	20.03	17.30	14.10	9.40	5.00	4.08	14.0											
		38	63	76	11226	22.60	19.63	16.83	13.90	9.20	4.93	4.16	14.3											
		41	64	76	11192	23.60	20.10	16.67	13.80	9.13	4.80	4.06	13.9	65	71	10333	14.83	12.90	10.93	9.33	6.50	3.57	4.90	17.5
		42	63	77	11363	23.70	20.17	16.70	13.97	9.30	4.80	4.08	14.0											
		45	65	77	11020	23.60	20.30	16.70	13.93	8.87	4.27	4.04	13.8											
		48	66	78	11226	25.03	21.27	17.37	13.93	8.70	4.07	3.96	13.5											
7/ 7/88	282869	21	100	106	9063	28.83	21.90	16.43	12.37	7.13	3.60	3.34	10.8											
		25	101	106	9466	31.57	24.10	18.40	13.60	7.43	3.63	3.28	10.5											
		28	101	106	9338	30.23	23.23	17.77	12.80	7.13	3.70	3.32	10.7											
		29	101	105	8994	30.17	22.83	17.43	12.83	7.27	3.67	3.28	10.5	93	91	10127	20.33	15.93	12.67	10.40	6.90	4.00	4.16	14.3
		33	101	105	9492	30.67	23.33	17.23	12.70	6.93	3.50	3.34	10.8											
		36	103	106	9166	29.10	21.57	16.33	11.83	6.60	3.47	3.36	10.9											
		37	102	106	9269	29.00	21.60	15.87	12.00	6.67	3.43	3.38	11.0											
		38	103	107	9089	29.33	21.87	16.00	11.97	6.47	3.43	3.32	10.7											
		41	104	107	9200	29.37	21.53	15.97	11.97	6.57	3.27	3.34	10.8	99	96	9303	19.17	14.80	11.47	9.33	5.90	3.33	4.10	14.1
		42	107	108	9441	30.40	22.97	16.50	12.63	6.90	3.37	3.34	10.8											
		45	104	109	9269	33.07	23.87	18.03	12.53	6.57	2.97	3.18	10.1											
		48	104	109	9132	34.47	24.53	18.87	12.47	6.33	2.83	3.10	9.7											

Table 44. Lane 2, section 1 NDT data (continued).

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
8/ 2/88	412535	21	95	96	9372	36.70	29.00	21.50	16.87	9.43	4.37	3.06	9.6											
		25	101	96	9235	35.17	28.63	21.87	17.13	9.57	4.13	3.10	9.7											
		28	98	97	9612	35.67	28.13	21.60	15.47	8.37	4.00	3.12	9.8											
		29	97	98	9509	36.13	28.17	21.43	16.33	8.97	4.20	3.10	9.7	95	88	9612	28.13	23.30	18.67	15.47	9.73	4.93	3.48	11.4
		33	98	98	8994	33.50	25.93	19.73	14.40	7.60	3.70	3.12	9.8											
		36	95	99	9200	33.87	25.33	19.30	13.80	7.47	3.70	3.14	9.9											
		37	98	99	9097	33.50	25.13	18.73	13.90	7.43	3.63	3.14	9.9											
		38	97	100	9166	32.63	25.03	18.37	13.73	7.23	3.50	3.18	10.1											
		41	99	100	9166	31.73	23.73	17.73	13.03	7.07	3.37	3.22	10.3	96	90	10677	28.77	23.27	18.50	15.00	9.40	4.63	3.62	12.0
		42	100	102	9235	31.20	23.80	17.13	13.30	7.17	3.30	3.26	10.4											
		45	99	102	9235	33.40	24.83	18.63	13.00	6.63	3.00	3.16	10.0											
		48	100	102	9303	33.37	24.50	18.37	12.53	6.17	2.63	3.18	10.1											
9/19/88	726648	21	88	77	10196	27.20	21.87	18.67	14.23	9.07	4.80	3.64	12.1											
		25	87	78	9990	27.43	22.60	17.67	14.73	8.83	4.23	3.60	11.9											
		28	89	78	10196	30.53	23.37	19.57	14.13	8.57	4.30	3.44	11.2											
		29	88	78	10436	28.73	22.83	19.33	14.53	8.97	4.43	3.58	11.8	84	73	11363	22.33	19.37	16.37	14.03	9.70	5.50	4.20	14.5
		33	89	79	10848	26.83	22.13	17.97	14.00	8.43	4.23	3.76	12.6											
		36	88	80	10299	27.87	22.53	18.47	13.97	8.47	4.20	3.62	12.0											
		37	89	80	10677	28.00	22.30	18.00	14.03	8.43	4.10	3.66	12.2											
		38	89	81	10951	27.03	22.27	17.87	14.03	8.20	4.07	3.76	12.6											
		41	89	82	10471	29.03	23.03	17.93	14.13	8.33	4.00	3.58	11.8	87	74	10848	20.50	17.57	14.53	12.47	8.47	4.43	4.28	14.8
		42	89	85	10780	28.63	23.03	17.90	14.23	8.43	3.97	3.64	12.1											
		45	91	85	11020	28.33	22.77	17.57	13.53	7.50	3.13	3.70	12.5											
		48	89	85	10866	29.80	23.60	18.10	13.25	7.00	2.90	3.60	11.9											
12/ 7/88	1.13e6	21	44	41	8857	10.93	8.90	9.27	6.60	4.87	3.13	5.26	19.1											
		25	45	41	10162	12.37	7.23	8.00	5.83	4.00	2.60	5.30	19.3											
		28	45	42	9784	23.27	12.57	24.27	6.97	4.63	2.80	3.84	12.9											
		29	46	42	9097	17.80	11.47	7.40	7.30	5.20	3.10	4.20	14.5	58	49	9166	12.67	11.33	10.37	9.13	7.00	4.30	4.98	17.9
		33	46	42	8926	8.03	6.90	6.03	5.17	3.80	2.40	6.16	23.0											
		36	46	42	8891	8.27	7.03	5.73	5.13	3.73	2.40	6.06	22.6											
		37	45	42	9406	8.03	6.90	5.90	5.20	3.77	2.40	6.32	23.7											
		38	49	42	9338	8.13	7.20	5.93	5.23	3.73	2.40	6.26	23.4											
		41	49	42	8994	8.93	7.40	6.07	5.27	3.80	2.40	5.86	21.7	57	49	9509	10.70	9.70	8.67	7.80	5.90	3.60	5.52	20.2
		42	49	44	9647	10.00	8.63	7.30	6.27	4.60	2.80	5.74	21.1											
		45	50	45	9509	9.50	8.23	7.10	6.30	4.60	2.23	5.84	21.6											
		48	52	46	9956	13.90	12.87	9.43	6.33	4.63	2.70	4.96	17.8											

APPENDIX G. LANE 2, SECTION 2 DATA

Table 45. Lane 2, section 2 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
6/18/87		448					448	448	81.9	61	87	.0
6/24/87		7319					7319	7767	89.8	63	91	.6
6/25/87		3779					3779	11546	81.6	69	93	.0
6/26/87		3092					3092	14638	80.2	69	87	.0
6/27/87							0	14638	81.5	68	91	.6
6/28/87							0	14638	81.7	72	86	.0
6/29/87	420		420		420		1260	15898	79.0	63	84	.0
6/30/87							0	15898	81.2	57	89	.0
7/ 1/87							0	15898		66	82	.0
7/ 2/87							0	15898		63	85	.0
7/ 3/87							0	15898		51	81	.0
7/ 4/87							0	15898		53	88	1.0
7/ 5/87							0	15898		68	93	.0
7/ 6/87							0	15898		65	92	.0
7/ 7/87							0	15898	85.2	71	88	.0
7/ 8/87	50		402		505		957	16855	87.0	70	90	.0
7/ 9/87					1545		1545	18400	88.7	72	86	.0
7/10/87							0	18400	83.7	68	86	.0
7/11/87					5126		5126	23526	84.4	68	83	.4
7/12/87					8601		8601	32127	80.1	73	92	.0
7/13/87	258						258	32385	74.9	71	96	.0
7/14/87							0	32385		74	93	.0
7/15/87					63		63	32448	83.3	74	92	.0
7/16/87					2232		2232	34680	82.7	70	94	.0
7/17/87							0	34680	77.3	68	94	.0
7/18/87							0	34680		66	92	.4
7/19/87							0	34680		63	86	.0
7/20/87					2612		2612	37292	98.5	53	78	.2
7/21/87							0	37292		60	80	.0
7/22/87							0	37292		57	85	.0
7/23/87							0	37292	93.8	63	91	.0
7/24/87					1549		1549	38841	94.2	65	92	.0
7/25/87							0	38841	89.7	67	95	.0
7/26/87							0	38841	87.9	77	98	.0
7/27/87					5305		5305	44146	87.0	71	96	.0
7/28/87					7096		7096	51242	86.3	70	96	.0
7/29/87					2444		2444	53686	84.5	74	97	.0
7/30/87					580		580	54266	88.3	72	97	.0
7/31/87							0	54266	83.8	70	93	.0
8/ 1/87							0	54266		68	92	.0
8/ 2/87							0	54266		63	88	.0
8/ 3/87					4336		4336	58602	95.5	58	88	.0
8/ 4/87					5804		5804	64406	91.9	62	93	.0
8/ 5/87					6296		6296	70702	85.9	67	93	.0
8/ 6/87					815		815	71517	87.5	69	87	.0
8/ 7/87					990		990	72507		70	90	.0
8/ 8/87							0	72507		74	97	.0
8/ 9/87							0	72507		71	97	.0
8/10/87					258		258	72765		70	89	.0
8/11/87					7387		7387	80152		69	87	.1
8/12/87					4902		4902	85054		65	86	.0
8/13/87					9537		9537	94591		70	93	.0
8/14/87					6646		6646	101237		73	95	.0
8/15/87					9095		9095	110332		67	93	.0
8/16/87					6507		6507	116839		58	87	.0
8/17/87					6226		6226	123065		56	87	.0
8/18/87					7017		7017	130082	95.2	60	86	.0
8/19/87					3270		3270	133352	82.6	57	87	.0
8/20/87					5085		5085	138437	83.4	63	90	.0
8/21/87					8717		8717	147154	84.3	70	89	.0
8/22/87					968		968	148122	79.5	70	98	.0

Table 45. Lane 2, section 2 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
8/23/87							0	148122	84.0	68	95	.0
8/24/87					8343		8343	156465	78.8	66	86	.0
8/25/87					8631		8631	165096	73.9	59	89	.0
8/26/87					8055		8055	173151	74.3	52	90	.0
8/27/87					5944		5944	179095	81.3	71	77	.2
8/28/87					6211		6211	185306	77.9	58	81	.0
8/29/87							0	185306		46	80	.0
8/30/87							0	185306		49	74	.0
8/31/87					8502		8502	193808	80.9	61	78	.0
9/ 1/87					7004		7004	200812	82.4	63	100	.0
9/ 2/87					8005		8005	208817	79.7	70	83	.2
9/ 3/87					7820		7820	216637	79.7	55	82	.0
9/ 4/87					3747		3747	220384	78.1	49	81	.0
9/ 5/87					3859		3859	224243	71.8	60	82	.1
9/ 6/87					8805		8805	233048	70.7	51	81	.0
9/ 7/87					1125		1125	234173	74.9	45	85	.0
9/ 8/87					5653		5653	239826	73.3	55	80	.0
9/ 9/87					7890		7890	247716	78.3	53	80	.0
9/10/87					1539		1539	249255	76.5	54	72	.0
9/11/87					8639		8639	257894	82.0	63	71	.0
9/12/87					3398		3398	261292	76.3	67	81	.0
9/13/87					827		827	262119	75.7	69	74	1.3
9/14/87					8207		8207	270326	75.9	66	86	2.2
9/15/87					7334		7334	277660	82.8	67	85	.0
9/16/87					8909		8909	286569	80.0	64	85	.0
9/17/87					7563		7563	294132	78.1	67	83	.0
9/18/87					7587		7587	301719	77.1	66	83	.0
9/19/87					8921		8921	310640	71.4	63	86	4.0
9/20/87					4207		4207	314847	67.0	58	86	.0
9/21/87					5434		5434	320281	69.3	61	86	.0
9/22/87					7402		7402	327683	77.2	66	87	.0
9/23/87					7139		7139	334822	72.1	66	85	.8
9/24/87					7746		7746	342568	73.4	61	71	.0
9/25/87					8699		8699	351267	75.8	61	65	.0
9/26/87					7308		7308	358575	73.4	59	78	.4
9/27/87					0		0	358575	76.8	55	77	.0
9/28/87					8316		8316	366891	77.5	51	74	.0
9/29/87					7452		7452	374343	75.6	51	77	.0
9/30/87					685		685	375028	72.8	47	69	.0
10/ 1/87					4925		4925	379953	74.8	41	75	.0
10/ 2/87					1469		1469	381422	69.6	51	81	.0
10/ 3/87					0		0	381422	59.0	51	83	.0
10/ 4/87					3765		3765	385187	66.1	56	81	.0
10/ 5/87					8065		8065	393252	67.5	55	75	.2
10/ 6/87					3910		3910	397162	70.1	43	65	.0
10/ 7/87					8226		8226	405388	65.5	40	73	.0
10/ 8/87					8195		8195	413583	62.8	44	62	.0
10/ 9/87					8346		8346	421929	65.3	40	59	.0
10/10/87					8837		8837	430766	65.1	35	69	.7
10/11/87					0		0	430766	63.8	41	71	.0
10/12/87					7167		7167	437933	62.5	41	64	.0
10/13/87					2956		2956	440889	65.8	34	58	.0
10/14/87					8183		8183	449072	63.3	29	63	.0
10/15/87					1823		1823	450895	54.2	47	75	.0
10/16/87					0		0	450895	55.3	47	61	.0
10/17/87					0		0	450895		33	55	.0
10/18/87					0		0	450895		30	58	.0
10/19/87					2		2	450897	77.5	29	62	.0
10/20/87					15		15	450912		28	67	.0
10/21/87					0		0	450912		32	75	.0
10/22/87					258		258	451170	67.8	35	70	.0
10/23/87					0		0	451170		37	68	.0
10/24/87					0		0	451170		37	72	.0
10/25/87					0		0	451170		46	73	.0
10/26/87					230		230	451400	71.7	36	59	.1

Table 45. Lane 2, section 2 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
10/27/87					2801		2801	454201	54.8	33	57	.0
10/28/87					8468		8468	462669	58.0	33	68	.0
10/29/87					1905		1905	464574	57.1	36	72	.0
10/30/87					8050		8050	472624	58.4	30	58	.0
10/31/87					7995		7995	480619	63.5	26	60	.0
11/ 1/87					0		0	480619	63.7	29	49	.0
11/ 2/87					8422		8422	489041	58.5	30	58	1.4
11/ 3/87					7015		7015	496056		27	57	.0
11/ 4/87					8880		8880	504936		30	66	.0
11/ 5/87					2161		2161	507097		39	69	.0
11/ 6/87					4668		4668	511765		36	71	.0
11/ 7/87					0		0	511765		39	70	.0
11/ 8/87					0		0	511765		41	75	.0
11/ 9/87					8168		8168	519933		47	80	.0
11/10/87					6618		6618	526551		45	67	.0
11/11/87					0		0	526551		27	51	.0
11/12/87					5613		5613	532164	55.1	28	63	.0
11/13/87					6529		6529	538693		42	77	.0
11/14/87					0		0	538693		56	70	.0
11/15/87					0		0	538693		31	57	.5
11/16/87					5757		5757	544450		29	34	1.1
11/17/87					9019		9019	553469		27	49	.2
11/18/87					2695		2695	556164		26	59	.0
11/19/87					6550		6550	562714		28	68	.0
11/20/87					7013		7013	569727		32	62	.0
11/21/87					0		0	569727		32	68	.0
11/22/87					0		0	569727		53	71	.4
11/23/87					5537		5537	575264		47	68	.0
11/24/87					2878		2878	578142		34	54	.0
11/25/87					0		0	578142		29	50	.0
11/26/87					0		0	578142		24	30	.0
11/27/87					0		0	578142		21	41	.0
11/28/87					0		0	578142		20	57	.0
11/29/87					0		0	578142		46	63	.0
11/30/87					0		0	578142		39	66	.0

Table 46. Lane 2, section 2 cracking history.

Date	No. of Passes	Lineal Cracking, in								
		62	66	70	74	78	82	86	90	Avg
6/17/87	0	0	0	0	0	0	0	0	0	0
9/10/87	248200	0	0	0	0	0	0	0	26	3
9/21/87	314847	21	37	99	79	154	87	46	246	96
9/30/87	375023	21	39	112	79	207	116	56	318	119
10/12/87	430766	21	39	119	79	288	132	74	460	152
10/29/87	462920	39	46	149	88	456	251	108	608	218
11/ 9/87	511765	40	46	192	93	540	332	163	637	255
11/16/87	538963	60	56	262	148	809	531	240	805	364
11/25/87	578142	122	70	499	270	1061	916	495	1130	570

Date	No. of Passes	Cracking and Patching, sq. ft / 1000 sq. ft								
		62	66	70	74	78	82	86	90	Avg
6/17/87	0	0	0	0	0	0	0	0	0	0
9/10/87	248200	0	0	0	0	0	0	0	0	0
9/21/87	314847	0	1	1	1	2	0	0	2	1
9/30/87	375023	0	1	1	1	2	0	0	2	1
10/12/87	430766	0	1	2	1	4	1	1	28	5
10/29/87	462920	0	1	4	2	211	67	2	89	47
11/ 9/87	511765	0	1	5	2	266	190	3	91	70
11/16/87	538963	1	1	7	5	435	398	43	233	140
11/25/87	578142	20	2	250	21	541	629	231	304	250

Table 47. Lane 2, section 2 rutting history.

Date	No. of Passes	Rut Depth, In								
		62	66	70	74	78	82	86	90	Avg
6/16/87	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
7/21/87	37292	.08	.23	.25	.21	.23	.22	.23	.36	.23
8/18/87	130082	.16	.33	.34	.30	.34	.44	.40	.62	.37
10/15/87	450895	.39	.50	.68	.68	.80	.68	.50	.78	.63
11/30/87	578142	.62	.74	.79	.84	1.16	1.18	.78	1.02	.89

Table 48. Lane 2, section 2 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
6/16/87	0	12.84	.00	.0	2.85
7/21/87	37292	12.24	.23	.0	2.81
8/18/87	130082	11.10	.57	.0	2.51
10/15/87	450895	45.31	.63	30.0	1.25
11/30/87	578142	82.89	.89	250.0	.10

Table 49. Lane 2, section 2 NDT data.

			Data of Test Section Centerline			Surface Deflection, mils Radial Offset, in								Data From Out of Wheelpath			Surface Deflection, mils Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp. F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
7/30/87	53686	63	90		8445	20.10	15.50	11.00	8.60	4.30	1.90	3.82	12.8	96		8239	18.90	14.20	10.20	7.90	4.40	2.10	3.88	13.1
		68	91		8239	21.90	16.90	12.60	9.30	4.70	2.00	3.62	12.0	96		8033	21.40	15.90	11.30	8.40	4.50	2.10	3.62	12.0
		73	91		8239	21.30	17.20	24.20	10.00	5.30	2.20	3.66	12.2	97		8033	20.30	15.20	11.20	8.50	4.80	2.30	3.70	12.3
		75	91		8239	22.00	17.80	13.40	10.20	5.40	2.20	3.60	11.9	97		8033	20.30	15.10	10.70	8.80	5.00	2.30	3.70	12.3
		77	91		8239	23.30	18.50	13.80	10.40	5.30	2.10	3.52	11.6	96		8033	20.30	15.30	11.30	8.90	5.00	2.20	3.70	12.3
		79	93		8239	23.20	18.30	14.10	10.40	5.30	2.00	3.52	11.6	99		8033	20.20	15.50	10.90	8.90	4.90	2.20	3.72	12.4
		81	88		8239	22.50	17.50	13.50	9.80	5.10	2.00	3.58	11.8	100		8033	19.80	15.10	11.50	8.80	4.90	2.20	3.74	12.5
		83	91		8239	21.50	17.00	13.00	9.60	4.90	1.90	3.64	12.1	99		8239	19.50	15.10	11.00	8.90	4.90	2.20	3.82	12.8
		88	91		8239	21.90	17.00	12.90	9.70	5.00	1.90	3.62	12.0	100		8033	20.60	16.00	11.60	9.40	5.20	2.30	3.68	12.2
8/27/87	173151	63	92		7827	17.90	14.00	11.70	8.10	4.30	1.80	3.88	13.1	99		8342	16.50	12.70	10.50	7.20	4.30	2.10	4.16	14.3
		68	93		7827	20.10	15.70	12.80	8.70	4.60	1.90	3.68	12.2	102		8857	18.10	13.90	11.30	7.70	4.30	2.10	4.10	14.1
		73	92		8548	22.30	17.80	15.00	10.60	5.80	2.40	3.66	12.2	104		8033	18.40	13.80	11.40	8.00	4.70	2.40	3.88	13.1
		75	97		9445	23.40	18.90	15.80	11.10	5.90	2.30	3.74	12.5	100		7827	17.80	13.80	11.60	8.30	4.90	2.30	3.90	13.2
		77	94		8651	25.60	20.20	16.60	11.00	5.60	2.40	3.44	11.2	99		8445	17.90	14.30	12.00	8.60	5.00	2.40	4.02	13.7
		79	93		8033	25.40	19.70	16.20	10.90	5.60	2.10	3.34	10.8	100		8445	18.30	14.50	12.20	8.70	5.00	2.20	3.98	13.6
		81	93		8239	22.80	18.20	15.00	10.20	5.20	2.10	3.56	11.7	103		8651	18.00	14.10	12.00	8.60	5.00	2.40	4.06	13.9
		83	98		8239	20.90	16.90	14.10	9.70	5.10	2.00	3.70	12.3	102		8239	17.90	14.40	12.20	8.90	5.20	2.30	3.98	13.6
		88	96		8445	20.30	16.10	13.60	9.50	5.10	1.70	3.86	13.0	101		8651	18.90	15.40	13.20	9.70	5.60	2.50	3.96	13.5
9/30/87	374343	63	70		9269	20.20	16.40	14.10	10.40	6.10	2.60	3.98	13.6	76		8651	16.50	14.10	12.40	9.40	5.60	2.80	4.24	14.7
		68	72		9063	23.50	19.50	16.10	11.10	6.20	2.60	3.66	12.2	76		8445	17.30	14.60	12.80	9.80	5.60	2.80	4.10	14.1
		73	70		9269	23.10	18.50	15.70	11.60	6.80	3.10	3.72	12.4	76		8342	16.90	14.30	12.60	9.80	5.90	3.10	4.12	14.2
		75	71		9269	23.90	19.70	16.90	12.50	7.00	3.20	3.68	12.2	77		8445	16.70	14.30	12.60	9.80	6.00	3.10	4.16	14.3
		77	72		9063	26.10	22.00	18.30	11.70	5.90	2.70	3.48	11.4	77		8651	17.10	14.30	12.80	10.00	6.10	3.10	4.16	14.3
		79	72		8857	30.90	23.90	19.20	12.60	6.20	2.70	3.20	10.2	77		8445	16.50	14.00	12.40	9.70	5.90	3.00	4.18	14.4
		81	72		8857	29.10	22.20	18.40	12.50	6.30	2.90	3.28	10.5	76		8445	15.70	13.50	12.00	9.50	5.80	2.90	4.28	14.8
		83	71		8857	25.10	20.00	17.60	13.00	6.30	2.80	3.52	11.6	76		8445	15.60	13.30	12.00	9.50	5.90	3.00	4.30	14.9
		88	71		8857	24.60	20.40	17.50	12.60	6.70	2.20	3.54	11.6	76		8342	15.90	13.80	12.50	10.00	6.10	3.10	4.24	14.7
10/29/87	462669	63	57		8857	13.60	10.80	9.40	7.20	4.60	2.00	4.70	16.7	59		8136	10.00	8.70	7.80	6.30	4.30	2.20	5.24	19.0
		68	57		8754	17.10	13.50	10.90	7.50	4.60	2.10	4.18	14.4	60		8033	9.70	8.50	7.60	6.30	4.30	2.20	5.30	19.3
		73	58		8651	16.50	13.00	11.10	8.30	5.20	2.60	4.24	14.7	59		8445	10.90	9.50	8.60	7.20	5.00	2.60	5.12	18.9
		75	57		8239	18.30	14.80	11.80	8.70	5.10	2.40	3.94	13.4	60		7930	11.10	9.70	8.80	7.40	5.20	2.60	4.92	17.6
		77	57		7930	22.70	14.70	12.30	7.50	4.40	2.20	3.50	11.5	60		8445	11.50	9.90	9.10	7.50	5.30	2.70	4.98	17.9
		79	57		6900	41.60	29.40	21.10	8.70	4.60	2.10	2.80	8.4	60		7827	11.20	9.80	8.90	7.40	8.10	2.60	4.86	17.4
		81	59		7930	25.60	19.40	15.20	9.30	5.40	2.50	3.30	10.6	60		7724	10.80	9.50	8.70	7.20	5.00	2.60	4.92	17.6
		83	57		7930	21.20	15.70	13.40	8.50	5.40	2.40	3.60	11.9	58		7724	10.50	9.30	8.50	7.10	5.00	2.60	4.98	17.9
		88	58		8445	19.80	16.30	13.30	10.30	4.60	1.70	3.84	12.9	60		8136	10.60	9.40	8.60	7.20	5.10	2.60	5.10	18.4

Table 49. Lane 2, section 2 NDT data (continued).

			Data of Test Section Centerline											Data From Out of Wheelpath										
						Surface Deflection, mils											Surface Deflection, mils							
						Radial Offset, in											Radial Offset, in							
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E_s ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E_s ksi
11/30/87	578142	63	50		8960	13.90	11.10	9.50	7.50	4.80	2.20	4.68	16.6	54		8842	10.50	9.20	8.40	7.00	4.90	2.50	5.34	19.4
		68	46		7930	21.60	15.70	12.90	7.90	4.40	2.30	3.58	11.8	50		8136	11.10	9.80	9.00	7.40	5.10	2.40	4.98	17.9
		73	48		7724	23.70	19.60	12.00	9.10	5.80	2.50	3.38	11.0	55		8960	12.40	10.90	9.80	8.10	5.60	2.90	4.94	17.7
		75	52		7621	21.90	19.10	16.30	8.00	5.00	2.30	3.48	11.4	49		8136	11.40	10.10	9.30	7.80	5.60	2.90	4.92	17.6
		77	60		6282	40.60	36.70	22.00	9.10	4.30	2.00	2.42	6.8	52		7930	11.90	10.60	9.80	8.20	5.80	3.00	4.76	16.9
		79	53		6076	56.90	30.80	22.60	8.00	3.10	1.50	2.08	5.3	66		7724	11.90	10.70	9.80	8.30	5.80	3.00	4.70	16.7
		81	49		6282	49.60	48.00	21.30	8.20	3.70	1.90	2.22	5.9	51		7812	11.60	10.40	9.50	8.00	5.60	2.90	4.78	17.0
		83	53		7106	53.10	32.10	25.80	8.60	4.50	2.20	2.26	6.1	53		7827	10.90	9.80	9.10	7.60	5.40	2.80	4.94	17.7
		88	52		7827	36.30	33.20	21.90	13.40	4.70	1.90	2.80	8.4	55		7930	11.10	10.00	9.20	7.90	5.60	2.90	4.92	17.6

APPENDIX H. LANE 2, SECTION 3 DATA

Table 50. Lane 2, section 3 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
1/ 8/87		240					240	240		29	43	.0
1/ 9/87		198					198	438		28	45	.0
1/10/87		0					0	438		33	42	.1
1/11/87		0					0	438		30	43	.0
1/12/87		2444					2444	2882		28	45	.0
1/13/87		3110					3110	5992		27	49	.0
1/14/87		3393					3393	9385		24	66	.0
1/15/87		3568					3568	12953		45	60	.1
1/16/87		2365					2365	15318		37	50	.0
1/17/87		0					0	15318		27	38	.0
1/18/87		0					0	15318		31	34	.4
1/19/87		0					0	15318		33	42	1.4
1/20/87		3659					3659	18977		34	42	.0
1/21/87		3742					3742	22719		31	40	.0
1/22/87		0					0	22719		26	32	2.3
1/23/87		139					139	22858		5	31	.0
1/24/87		0					0	22858		-2	25	.0
1/25/87		0					0	22858		-5	18	.7
1/26/87		45					45	22903		3	26	.9
1/27/87		2464					2464	25367		-9	24	.0
1/28/87		2883					2883	28250		-17	35	.0
1/29/87	310	290	295		282		1177	29427		-1	41	.4
1/30/87					761		761	30188		28	44	.2
1/31/87					0		0	30188		29	40	.0
2/ 1/87					0		0	30188		18	40	.0
2/ 2/87					3167		3167	33355		27	58	.0
2/ 3/87					3632		3632	36987		20	50	.0
2/ 4/87					286		286	37273		34	45	.0
2/ 5/87					3676		3676	40949		25	43	.0
2/ 6/87					1932		1932	42881		18	52	.0
2/ 7/87					0		0	42881		23	51	.0
2/ 8/87					3400		3400	46281		24	53	.0
2/ 9/87					9040		9040	55321		23	33	.0
2/10/87					8603		8603	63924		20	48	.0
2/11/87					8774		8774	72698		20	47	.0
2/12/87					4777		4777	77475		25	43	.1
2/13/87					3465		3465	80940		28	44	.0
2/14/87					0		0	80940		19	39	.0
2/15/87					3486		3486	84426		14	29	.0
2/16/87					9148		9148	93574		11	28	.0
2/17/87					7300		7300	100874		28	37	.0
2/18/87					6748		6748	107622		20	44	.0
2/19/87					7832		7832	115454		14	45	.0
2/20/87					4732		4732	120186		15	45	.0
2/21/87					0		0	120186		23	48	.0
2/22/87					0		0	120186		19	48	.7
2/23/87					0		0	120186		32	46	2.2
2/24/87					0		0	120186		28	45	.0
2/25/87					800		800	120986		16	43	.0
2/26/87					3406		3406	124392		16	42	.0
2/27/87					2035		2035	126427		28	41	.0
2/28/87					0		0	126427		31	44	.6
3/ 1/87					0		0	126427		43	69	.3
3/ 2/87					5599		5599	132026		37	53	.0
3/ 3/87					3834		3834	135860		31	55	.0
3/ 4/87					3987		3987	139847		23	37	.0
3/ 5/87					4282		4282	144129		16	43	.0
3/ 6/87					2209		2209	146338		21	60	.0
3/ 7/87					0		0	146338		31	75	.0
3/ 8/87					0		0	146338		30	76	.0
3/ 9/87					558		558	146896		28	66	.0

Table 50. Lane 2, section 3 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
3/10/87					0		0	146896		19	34	.0
3/11/87					0		0	146896		19	40	.0
3/12/87					0		0	146896		22	47	.0
3/13/87					0		0	146896		25	46	.0
3/14/87					0		0	146896		19	48	.0
3/15/87					0		0	146896		32	42	.2
3/16/87					0		0	146896		25	47	.2
3/17/87					4467		4467	151363		22	54	.0
3/18/87					5590		5590	156953		23	58	.0
3/19/87					4783		4783	161736		28	56	.0
3/20/87					1908		1908	163644		24	61	.0
3/21/87					0		0	163644		35	53	.0
3/22/87					0		0	163644		31	57	.0
3/23/87					5567		5567	169211		25	63	.0
3/24/87					8260		8260	177471		28	68	.0
3/25/87					6713		6713	184184		34	64	.1
3/26/87					5894		5894	190078		47	71	.0
3/27/87					5471		5471	195549		37	70	.0
3/28/87					0		0	195549		43	65	.4
3/29/87					0		0	195549		42	75	.0
3/30/87					0		0	195549		53	60	.2
3/31/87					319		319	195868		31	63	.2
4/ 1/87					7166		7166	203034		20	50	.0
4/ 2/87					5163		5163	208197		33	63	.1
4/ 3/87					8717		8717	216914		32	46	.5
4/ 4/87					5936		5936	222850		36	56	1.5
4/ 5/87					5930		5930	228780		32	42	.1
4/ 6/87					7442		7442	236222		32	45	.4
4/ 7/87					2328		2328	238550		43	57	.0
4/ 8/87					6846		6846	245396		39	63	.0
4/ 9/87					8198		8198	253594		33	61	.0
4/10/87					5812		5812	259406		39	71	.0
4/11/87					5015		5015	264421		41	75	.0
4/12/87					2437		2437	266858		39	67	.0
4/13/87					0		0	266858		42	62	.0
4/14/87					0		0	266858		37	67	.0
4/15/87					4559		4559	271417		46	53	.2
4/16/87					5348		5348	276765		46	50	.8
4/17/87					0		0	276765		49	64	.4
4/18/87					0		0	276765		54	65	.0
4/19/87					0		0	276765		53	71	.0
4/20/87					0		0	276765		54	75	.0
4/21/87					184		184	276949		56	78	.0
4/22/87					2569		2569	279518		50	86	.0
4/23/87					4176		4176	283694		51	61	.0
4/24/87					6791		6791	290485		50	59	.7
4/25/87					5655		5655	296140		39	52	.1
4/26/87					5750		5750	301890		36	65	.0
4/27/87					7551		7551	309441		31	66	.0
4/28/87					7823		7823	317264		37	59	.0
4/29/87					7584		7584	324848		32	77	.0
4/30/87					7182		7182	332030		48	67	.0
5/ 1/87					0		0	332030		36	72	.0
5/ 2/87					0		0	332030		46	71	.0
5/ 3/87					0		0	332030		51	78	.4
5/ 4/87					6858		6858	338888		42	53	.7
5/ 5/87					8879		8879	347767		34	65	.0
5/ 6/87					4410		4410	352177		37	75	.0
5/ 7/87					4271		4271	356448		41	80	.0
5/ 8/87					8704		8704	365152		43	70	.0
5/ 9/87					5075		5075	370227		37	79	.0
5/10/87					0		0	370227		44	87	.0
5/11/87					6662		6662	376889		50	89	.0
5/12/87					8616		8616	385505		62	88	.2
5/13/87					8040		8040	393545		54	67	.0

Table 50. Lane 2, section 3 loading and environmental history (continued).

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
5/14/87					8523		8523	402068		53	69	.0
5/15/87					9020		9020	411088		53	80	.4
5/16/87					0		0	411088		45	73	.0
5/17/87					0		0	411088		47	87	.0
5/18/87					5724		5724	416812		53	91	.0
5/19/87					8590		8590	425402		52	67	.1
5/20/87					8623		8623	434025		49	57	.4
5/21/87					7461		7461	441486		53	71	.0
5/22/87					3068		3068	444554		53	79	.0
5/23/87					0		0	444554		65	85	.0
5/24/87					0		0	444554		64	85	.0
5/25/87					0		0	444554		60	69	.0
5/26/87					7738		7738	452292		58	68	.0
5/27/87					7148		7148	459440		60	73	.0
5/28/87					8498		8498	467938		62	84	.0
5/29/87					8284		8284	476222		60	92	.0
5/30/87					4136		4136	480358		64	95	.0
5/31/87					0		0	480358		67	89	.1
6/ 1/87					7692		7692	488050		64	90	.0
6/ 2/87					8164		8164	496214		62	87	.0
6/ 3/87					2968		2968	499182		65	86	.2
6/ 4/87					3480		3480	502662		60	76	.6

Table 51. Lane 2, section 3 cracking history.

Date	No. of Passes	Lineal Cracking, in								
		99	103	107	111	115	119	123	127	Avg
1/ 7/87	0	0	0	0	0	0	0	0	0	0
4/15/87	266858	0	0	0	0	0	0	0	51	6
4/22/87	279518	0	0	0	0	0	0	0	82	10
4/30/87	329156	0	0	0	0	0	0	63	392	57
5/11/87	370234	0	0	0	0	0	0	63	538	75
5/18/87	411088	33	10	22	10	0	46	225	721	133
6/ 2/87	488285	79	10	22	61	44	154	466	935	221
6/ 8/87	502662	112	50	115	121	62	258	597	1051	296

Date	No. of Passes	Cracking and Patching, sq. ft / 1000 sq. ft								
		99	103	107	111	115	119	123	127	Avg
1/ 7/87	0	0	0	0	0	0	0	0	0	0
4/15/87	266858	0	0	0	0	0	0	0	0	0
4/22/87	279518	0	0	0	0	0	0	0	0	0
4/30/87	329156	0	0	0	0	0	0	0	15	2
5/11/87	370234	0	0	0	0	0	0	0	133	17
5/18/87	411088	0	0	0	0	0	0	0	162	20
6/ 2/87	488285	23	0	0	1	1	2	280	210	65
6/ 8/87	502662	23	1	1	1	3	17	283	212	67

Table 52. Lane 2, section 3 rutting history.

		Rut Depth, In								
Date	No. of Passes	99	103	107	111	115	119	123	127	Avg
1/ 5/87	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
2/12/87	77475	.10	.00	.06	.03	.00	.06	.04	.12	.05
3/13/87	146896	.10	.02	.08	.03	.08	.11	.12	.12	.08
4/21/87	276949	.10	.08	.28	.17	.12	.27	.52	.82	.30
5/18/87	416812	.43	.39	.53	.50	.70	.91	1.14	1.50	.76

Table 53. Lane 2, section 3 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
1/ 5/87	0	10.03	.00	.0	3.04
2/12/87	77475	6.96	.05	.0	3.31
3/12/87	146896	10.84	.08	.0	2.97
4/21/87	276949	21.56	.30	10.0	2.29
5/18/87	416812	41.54	.76	133.0	1.01

Table 54. Lane 2, section 3 NDT data.

Date	No. of Passes	Sta	Data of Test Section Centerline											Data From Out of Wheelpath										
			Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	Surface Deflection, mils						SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	Surface Deflection, mils						SN	E, ksi
						Radial Offset, in											Radial Offset, in							
						.00	8.30	15.40	20.10	31.90	50.0						.00	8.30	15.40	20.10	31.90	50.0		
2/12/87	72698	103	38		12050	12.4	11.3	10.2	9.4	7.2	4.4	5.72	21.1	38		13865	9.4	8.3	7.7	6.9	5.2	3.1	7.08	27.0
		105	37		11432	12.5	11.3	10.4	9.3	7.0	4.3	5.56	20.4	38		11432	13.1	11.9	11.0	9.8	7.5	4.5	5.44	20.0
		108	37		11741	12.0	10.8	10.0	8.9	6.8	4.3	5.74	21.2	37		11638	12.7	11.4	10.7	9.4	7.2	4.4	5.56	20.4
		110	37		11638	11.3	10.2	9.6	8.6	6.6	4.2	5.90	21.9	35		11123	12.0	10.9	10.3	9.1	7.0	4.3	5.58	20.5
		112	38		11432	11.0	11.0	10.0	8.5	6.6	4.2	5.92	22.0	36		11329	11.6	10.6	10.0	8.9	6.8	4.3	5.74	21.2
		114	37		11638	10.9	10.9	10.1	8.5	6.6	4.1	6.00	22.3	38		11432	11.3	10.4	9.6	8.8	6.9	4.3	5.84	21.6
		119	37		11432	12.4	12.4	11.2	9.3	7.2	4.4	5.58	20.5	40		12256	11.9	10.7	10.0	9.0	6.8	4.3	5.90	21.9
		121	40		11432	12.5	12.5	11.5	9.8	7.5	4.6	5.56	20.4	34		11947	11.6	10.7	9.9	9.1	7.0	4.4	5.90	21.9
3/16/87	146896	103	37		11329	12.1	11.1	9.9	9.3	7.0	4.3	5.62	20.6	43		12050	12.7	11.5	10.6	9.5	7.2	4.4	5.66	20.8
		105	40		11638	12.3	11.2	10.3	9.2	6.9	4.2	5.66	20.8	39		11329	12.8	11.6	10.7	9.6	7.1	4.3	5.64	20.7
		108																						
		110	37		11741	10.9	9.8	9.4	8.2	6.3	4.0	6.04	22.5	39		11432	12.0	11.0	10.2	9.1	7.0	4.3	5.82	21.5
		112																						
		114	37		11741	11.0	10.1	9.1	8.5	6.6	4.1	6.00	22.3	37		11432	11.3	10.3	9.5	8.7	6.6	4.1	5.92	22.0
		119	37		11226	13.0	11.7	10.5	9.6	7.4	4.6	5.60	20.6	40		11947	11.9	10.8	10.0	9.0	6.9	4.3	5.86	21.7
		121	39		11226	13.3	12.3	10.9	10.4	7.9	4.7	5.54	20.3	34		11020	11.8	10.8	9.9	9.1	7.0	4.3	5.88	21.8
5/18/87	411088	103	89		11844	38.0	32.1	25.4	21.0	12.1	5.1	3.34	10.8	97		11535	37.1	30.9	27.0	20.4	12.0	5.4	3.38	11.0
		105	91		11844	39.8	32.5	25.9	20.7	11.8	5.0	3.28	10.5	98		11432	38.1	31.6	27.4	20.8	12.1	5.4	3.26	10.4
		108																						
		110	91		11844	37.3	30.6	25.4	20.6	12.4	5.6	3.38	10.9	96		11432	37.2	31.2	28.3	20.9	12.6	5.8	3.30	10.6
		112	89		11844	36.7	30.7	27.7	21.3	13.1	5.8	3.40	11.0	98		11638	36.0	30.4	26.6	20.8	12.6	5.7	3.42	11.1
		114	91		11638	37.3	32.7	28.6	22.7	13.8	5.7	3.38	10.9	97		11432	35.7	30.4	26.8	20.9	12.6	5.6	3.36	10.9
		119												99		11432	37.8	32.1	28.6	21.8	13.2	5.9	3.28	10.5
		121												100		11432	37.0	31.6	28.6	21.9	13.1	6.0	3.30	10.6

APPENDIX I. LANE 2, SECTION 4 DATA

Table 55. Lane 2, section 4 loading and environmental history.

Date	9.4 kips	11.6 kips	14.1 kips	16.4 kips	19.0 kips	22.5 kips	Total Pass	Cumm Passes	Avg Pvmt Temp F	Min Air Temp F	Max Air Temp F	Total Precip in
1/ 9/89						54	54	54		34	38	.5
1/10/89						433	433	487		32	37	.0
1/11/89						321	321	808	35.8	25	50	.0
1/12/89						9221	9221	10029	34.8	36	44	.5
1/13/89						8700	8700	18729	34.7	36	40	.0
1/14/89						8971	8971	27700	32.9	18	36	.0
1/15/89						0	0	27700	33.8	32	48	.0
1/16/89						8501	8501	36201	34.9	36	46	.0
1/17/89						8206	8206	44407	34.9	28	51	.0
1/18/89						6481	6481	50888	36.2	26	55	.0
1/19/98						9008	9008	59896	37.1	26	59	.0
1/20/89						3850	3850	63746	35.8	30	41	.0
1/21/89						51	51	63797	34.5	20	33	.0
1/22/89						0	0	63797	32.2	18	46	.0
1/23/89						8395	8395	72192	36.1	25	55	.0
1/24/89						9010	9010	81202	34.9	24	61	.0
1/25/89						8121	8121	89323	35.2	41	46	.0
1/26/89						7387	7387	96710	34.3	38	50	.0
1/27/89						7577	7577	104287	36.1	38	58	.1
1/28/89						9131	9131	113418	35.6	29	53	.0
1/29/89						299	299	113717	35.2	30	62	.0
1/30/89						8550	8550	122267	35.5	42	56	.0
1/31/89						8854	8854	131121	35.9	31	58	.0
2/ 1/89						8372	8372	139493	37.8	40	73	.0
2/ 2/89						334	334	139827	36.4	38	64	.0
2/ 3/89						4962	4962	144789	36.4	32	46	.0
2/ 4/89						4418	4418	149207	33.8	20	32	.0
2/ 5/89						0	0	149207	33.3	27	33	.0
2/ 6/89						7865	7865	157072	35.3	32	52	.6
2/ 7/89						7801	7801	164873	32.8	30	40	.0
2/ 8/89						2603	2603	167476	32.8	23	40	.0
2/ 9/89						2294	2294	169770	32.4	17	26	.0
2/10/89						13	13	169783		16	35	.0
2/11/89						0	0	169783		18	50	.0
2/12/89						0	0	169783		20	47	.0
2/13/89						7845	7845	177628	33.2	24	32	.2
2/14/89						9149	9149	186777	34.2	34	53	.5
2/15/89						8425	8425	195202	35.6	45	67	.1
2/16/89						7904	7904	203106	34.6	32	42	.3
2/17/89						3176	3176	206282	32.6	28	37	.0
2/18/89						0	0	206282		23	51	.0
2/19/89						0	0	206282		30	54	.0
2/20/89						8914	8914	215196		32	51	.0
2/21/89						8799	8799	223995		39	52	.1
2/22/89						5088	5088	229083	36.0	41	46	1.1
2/23/89						4539	4539	233622	33.6	20	33	.2

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Table 56. Lane 2, section 4 cracking history.

Date	No. of Passes	Lineal Cracking, in 137	141	145	149	153	157	161	165	Avg
1/ 9/89	0	0	0	0	0	0	0	0	0	0
2/ 1/89	133282	44	0	0	0	0	0	26	0	9
2/ 8/89	165717	227	0	0	0	8	0	70	22	41
2/20/89	209354	427	0	24	39	32	43	206	119	111
2/27/89	233622	576	21	89	135	114	290	1054	958	405

Date	No. of Passes	Cracking and Patching, sq. ft / 1000 sq. ft 137	141	145	149	153	157	161	165	Avg
1/ 9/89	0	0	0	0	0	0	0	0	0	0
2/ 1/89	133282	0	0	0	0	0	0	0	0	0
2/ 8/89	165717	40	0	0	0	0	0	1	0	5
2/20/89	209354	220	0	0	0	0	1	15	18	32
2/27/89	233622	255	0	0	1	1	126	569	556	189

Table 57. Lane 2, section 4 rutting history.

Date	No. of Passes	Rut Depth, in 137	141	145	149	153	157	161	165	Avg
1/ 5/89	0	.00	.00	.00	.00	.00	.00	.00	.00	.00
1/18/89	45705	.12	.06	.06	.10	.06	.02	.00	.06	.06
1/25/89	81596	.14	.08	.08	.14	.08	.04	.02	.08	.08
2/ 1/89	133282	.18	.08	.10	.14	.08	.06	.04	.08	.10
2/ 8/89	165717	.20	.10	.12	.18	.08	.08	.08	.10	.12
2/15/89	190070	.37	.10	.12	.18	.12	.08	.06	.10	.14
2/27/89	233622	1.17	.12	.16	.22	.12	.12	.35	.35	.33

Table 58. Lane 2, section 4 PSI history.

Date	No. of Passes	Slope Variance 0.000001	Avg Rut Depth in	Craking and Patching sq ft/1000 sq ft	PSI
1/ 5/89	0	2.57	.00	.0	3.97
1/18/89	44407	3.49	.06	.0	3.78
1/25/89	81202	3.08	.08	.0	3.85
2/ 1/89	131121	7.82	.10	.0	3.21
2/ 8/89	164873	31.63	.12	5.1	2.10
2/15/89	186777	120.64	.14	32.0	.96
2/27/89	233622	201.80	.33	189.0	.34

Table 59. Lane 2, section 4 NDT data.

			Data of Test Section Centerline											Data From Out of Wheelpath											
						Surface Deflection, mils											Surface Deflection, mils								
						Radial Offset, in											Radial Offset, in								
Date	No. of Passes	Sta	Pvmt Surf Temp F	Avg Pvmt Temp F.	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi	Pvmt Surf Temp F	Avg Pvmt Temp F	Load lbs	.00	8.30	15.40	20.10	31.90	50.0	SN	E, ksi
12/ 7/88	0	137	60	48	11775	16.17	14.07	12.83	10.67	7.63	4.43	5.14	18.6											
		140	62	48	12634	15.67	13.90	12.40	10.70	7.97	4.70	5.40	19.7											
		144	61	48	12805	15.30	13.53	11.97	10.57	7.83	4.60	5.50	20.1											
		145	60	48	12428	15.10	13.40	12.00	10.53	7.80	4.60	5.46	20.0	60	49	11295	16.00	14.13	12.53	11.10	8.20	4.70	5.08	18.3
		147	61	48	12668	15.03	13.50	11.73	10.57	7.80	4.60	5.52	20.2											
		149	60	48	12565	15.40	13.70	12.07	10.73	7.90	4.63	5.44	19.9											
		152	59	48	12565	15.67	14.10	12.40	11.00	8.10	4.73	5.40	19.7											
		153	61	48	12565	15.93	14.33	12.57	11.13	8.23	4.83	5.36	19.5											
		154	60	48	12737	16.13	14.43	12.47	11.30	8.30	4.97	5.36	19.5											
		157	60	48	12737	16.67	14.80	13.03	11.70	8.70	5.20	5.26	19.1	60	49	11192	15.93	13.93	12.30	11.03	8.20	4.80	5.06	18.2
		158	60	48	12565	16.63	14.80	13.17	11.70	8.70	5.20	5.24	19.0											
		161	58	48	13732	17.37	15.30	13.40	12.00	8.87	5.30	5.36	19.5											
		164	60	48	11020	14.93	13.03	11.70	10.27	7.57	4.47	5.12	18.5											
2/ 2/89	139493	137	59	53	11501	36.70	29.53	27.03	20.27	14.00	7.50	3.48	11.4											
		140	60	54	11432	28.83	26.30	21.87	19.07	13.03	7.13	3.88	13.1											
		144	54	54	11363	29.07	25.37	22.53	18.97	13.33	7.03	3.84	12.9											
		145	59	55	11501	30.83	26.87	23.30	19.80	13.43	7.30	3.76	12.6	64	72	10951	18.90	17.03	15.33	13.30	9.80	5.63	4.62	16.3
		147																						
		149	60	59	11295	30.30	26.50	22.80	19.53	13.53	7.37	3.76	12.6											
		152	61	60	11157	30.37	26.23	23.00	19.70	13.83	7.13	3.74	12.5											
		153	61	61	10986	30.57	27.07	22.73	19.60	13.30	6.97	3.70	12.3											
		154	61	63	11157	30.40	27.60	23.33	19.30	12.93	7.03	3.74	12.5											
		157	61	66	10986	31.07	27.40	23.50	20.40	14.40	7.37	3.68	12.2	64	73	11089	19.43	17.63	15.57	13.90	10.20	5.77	4.58	16.2
		158	61	68	11157	30.83	28.00	23.20	21.70	14.23	7.47	3.72	12.4											
		161	63	69	11192	32.80	28.80	24.50	20.53	14.43	7.80	3.62	12.0											
		164	62	71	11157	33.07	30.10	25.23	22.40	15.53	7.90	3.60	11.9											
2/27/89	233622	137																						
		140	48	40	11672	30.07	27.13	22.70	20.03	14.20	8.07	3.84	12.9											
		144	49	40	11501	32.20	27.40	23.43	19.97	14.47	7.97	3.80	12.8											
		145	49	41	11569	32.97	28.37	24.27	20.90	14.13	8.03	3.66	12.2	45	45	11398	19.40	17.67	16.20	14.23	10.77	6.37	4.64	16.4
		147																						
		149	47	41	11432	34.90	29.10	24.20	21.27	15.20	8.40	3.54	11.6											
		152	47	41	11432	33.87	29.23	25.30	21.83	16.10	8.67	3.60	11.9											
		153	48	41	11501	33.13	30.40	25.33	22.97	15.23	8.30	3.64	12.1											
		154	49	42	11295	35.90	32.30	26.37	21.47	14.70	7.83	3.48	11.4											
		157	51	42	11617	37.90	33.40	27.27	25.53	19.17	7.40	3.44	11.2	45	46	11569	19.90	18.20	16.43	14.93	11.43	6.97	4.62	16.3
		158	49	42	11535	41.37	41.13	27.93	34.10	17.03	7.63	3.30	10.6											
		161	49	43	10883	58.37	51.60	40.57	26.37	13.53	7.87	2.76	8.3											
		164	52	43	11123	60.63	48.00	31.33	24.17	16.23	8.63	2.74	8.2											

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