STATE OF FLORIDA

FLEXIBLE PAVEMENT SMOOTHNESS REPORT

FL/DOT/SMO/06-487
January 2006

STATE MATERIALS OFFICE

This report is a result of the dedicated effort and contribution by the following individuals:

Salil Koghale

William Bryant

John Schiffermuller

Gregory Beckner

Glen Salvo

Alexander Mraz

Stacy Scott

Robert Schaub

Abdenour (Nour) Nazef

To access the electronic copy of this and other reports, please follow the steps below:

1) logon to the State Materials Office's website (http://www.dot.state.fl.us/statematerialsoffice/)

2) Under Divisions, select Pavement Materials

3) Under Research, select Research Reports

**** Title 23 U.S.C. Section 409, provides that this information provided to you is not subject to discovery nor is it admissible into evidence.**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Executive Summary

The traveling public wants smooth, safe, and long lasting pavements. Initial Pavement smoothness has been shown to improve the overall pavement performance. The Florida Department of Transportation (FDOT) has developed smoothness specifications for the acceptance of asphalt pavements on high-speed facilities based on smoothness results obtained with high-speed inertial profilers. The ultimate goal is to implement incentive/disincentive specifications aimed at rewarding contractors for a high quality pavement , and provide a deterrent at the same time for poor quality work.

This report is a synthesis of statewide project smoothness data collected between November 11, 1997 and December 5, 2005. It provides the end user with basic statistics on the Ride quality of projects tested for Ride Acceptance (RA) and for Ride Evaluation (RE). RA testing is for project acceptance purposes as required by the smoothness specifications, whereas RE is conducted for information only.

The information presented herein is summarized on a statewide basis as well as by District, by roadway system type, by friction course type, and by contractor. Furthermore, Appendix A provides Ride data by project for each District, whereas Appendix B provides other ancillary Ride statistics, and a customer service form at the end of the report.

**** Title 23 U.S.C. Section 409, provides that this information provided to you is not subject to discovery nor is it admissible into evidence.**

Introduction

Pavement smoothness is probably the single most important indicator of performance from the standpoint of the traveling public, and a major determinant of roadway users' costs. A survey of highway users showed that pavement smoothness is second in importance to safety. Thus, attaining acceptable surface smoothness on newly constructed and rehabilitated pavements is an important goal for highway agencies.

FDOT RIDE QUALITY

Ride quality has been used by FDOT for evaluating new construction and overlays projects (Ride Acceptance and Ride Evaluation), and for monitoring long-term pavement performance at the network level. To measure pavement ride quality, automated or manual methods are used to measure roadway profiles from which a roughness value is calculated. Most states including Florida use high speed inertial profilers to measure smoothness. The commonly used measures of are the International Roughness Index (IRI) and the Ride Number (RN). Since 1998, FDOT has been using the RN for project level acceptance, and evaluation in accordance with ASTM E-1489.

The FDOT has worked very closely with the Federal Highway Administration (FHWA) and the construction industry to improve pavement smoothness on Florida's state highways. To this end, a smoothness task team was created with representatives from FDOT, FHWA and the paving industry to develop and implement non-contact profiler based smoothness specifications. Sub-article 330-12.6 of the FDOT Standard Specifications sets the requirements for Acceptance Testing for Pavement Smoothness by Laser Profiler.

RIDE QUALITY EVALUATION PROCESS

The Pavement Condition Unit of the State Materials Office (SMO) is responsible for conducting smoothness evaluation using an inertial high speed laser profiler. Florida test method FM 5-549 provides the method by which a pavement is evaluated for smoothness using the longitudinal profiles recorded from each wheelpath using an inertial profiler test vehicle..

The test vehicle uses a three laser sensor system, and two accelerometers mounted in the front bumper of a full-size van. Two of the laser sensors are mounted equidistant from the bumper centerline so as to measure the longitudinal profiles in the left and right wheel paths of the traveled surface. These 32 kHz lasers measure the vertical distance from the pavement surface at an initial rate of 30 readings per inch as the vehicle travels at 60 mph. The data is filtered, and is later reduced to a 6 inch recording interval. The accelerometers are mounted atop the two outside lasers to isolate the vehicle vertical motion and thus provide a "zero" reference plane. The vehicle is also equipped with a data acquisition system to collect and store the elevation profile data. A Distance Measuring Instrument (DMI) is connected to the vehicle front drive axle and is used to record the longitudinal distance traveled.

The vehicle is driven along the wheelpaths of the pavement section to be evaluated. As the vehicle travels at highway speed, the sensors measure the vertical acceleration of the vehicle and the vertical distance between the accelerometers and the pavement surface, as well as the traveled distance. The sensor signals are combined through a computerized process to generate the longitudinal profiles in both wheelpaths, from which the Profile Index (PI) statistic is derived. The resulting PI values are then processed through a non-linear mathematical transform to yield RN value(s) for each 0.1 mile or any other desired reporting interval.

The laser profilers currently in use by FDOT are manufactured by International Cybernetics Corporation (ICC) of Largo, Florida. All of these profilers are owned by FDOT with the exception of one unit that is provided through a contract with Applied Research Associates, Inc. (ARA). Currently this profiler is the primary unit used by the SMO for the collection of project level smoothness data.

District project personnel may submit all requests for pavement evaluations using online request forms available at the SMO's website:

Intranet: http://materials.dot.state.fl.us/smo/pavement/pavementhome.htm
Internet: http://www.dot.state.fl.us/statematerialsoffice/pavement/pavementhome.htm

WHAT IS RIDE NUMBER?

The Pavement Serviceability Index (PSI) has been used by engineers since the AASHO road test in the 1950s as an estimate of the opinion of the traveling public of the roughness (or lack of smoothness) of roads. The Ride Number (RN) is a profile index similar to the PSI, and was a result of NCHRP research study 1-23 in the 1980's (*2*). It is an index that rates rideability of a road using a 0 to 5 scale, where an RN of 5.0 is considered to be a perfect ride quality road, and an RN of zero is an impassable road. The 0 to 5 scale was used because it was familiar to the highway community as it corresponds to the mean panel rating that would be given to a pavement section based on drivers' perception of a pavement roughness. The definition of these two end limits are given in section 4.3.2 of ASTM E 1489.

The RN is defined by the following equation (3):

$$RN = 5e^{-160PI} \quad \text{..... (1)}$$

Where:

$$PI = \sqrt{\frac{(PI_L{}^2 + PI_R{}^2)}{2}} \quad \text{..... (2)}$$

PI_L = Profile Index in the Left wheel path (ft/ft)

PI_R = Profile Index in the Right wheel path (ft/ft)

FDOT PROFILER CERTIFICATION PROGRAM

The success of a smoothness specification depends to a large extent on the successful implementation of a FDOT Profiler Certification Program (FPCP). This program will entail a set of standard procedures for verifying the operational accuracy and repeatability of all inertial profiling equipment used on FDOT projects, and provides a venue for qualifying equipment system operators through a certification process. Under the anticipated FPCP, all inertial profilers used must successfully perform and pass certification tests to establish compliance with the minimum requirements for accuracy and repeatability.

Observations and General Notes

The following points/observations were made during the compilation of this report.

1. The statistics presented in this report represent project Ride Acceptance (RA) and Ride Evaluation (RE) data collected with SMO's laser profilers from November 5, 1997 to December 5, 2005. There are two(2) other laser profilers being operated by District 4/6 and the Turnpike district in addition to the profilers operated by the SMO staff. The information presented herein may not include all of the data collected with the profilers from District 4/6 and the Turnpike District.
2. The data analyzed herein consists only of full lots (0.1 mile length.) All partial lots (ie, lots <0.1 mile) have been excluded from the analysis.
3. All data has been processed in English units. Data originally collected in Metric units were re-processed in English units for the purpose of this report.

Statewide Ride Distribution

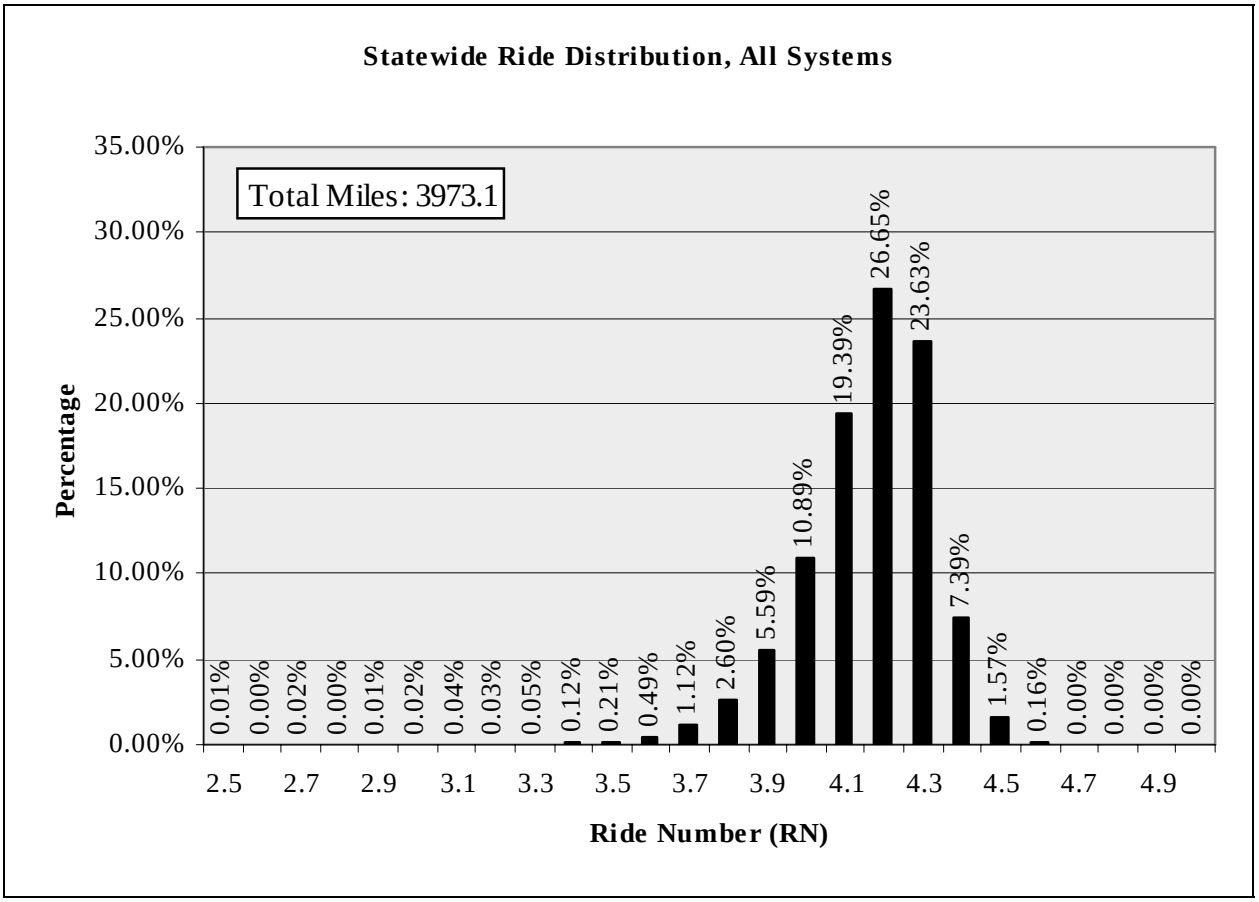

Figure 1 Statewide Ride Distribution for Project Level Data, All Systems

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	3,973.1	39,731	1.4	4.2	4.6	0.18	128	12.8

Statewide Ride Distribution by System Type

Primary

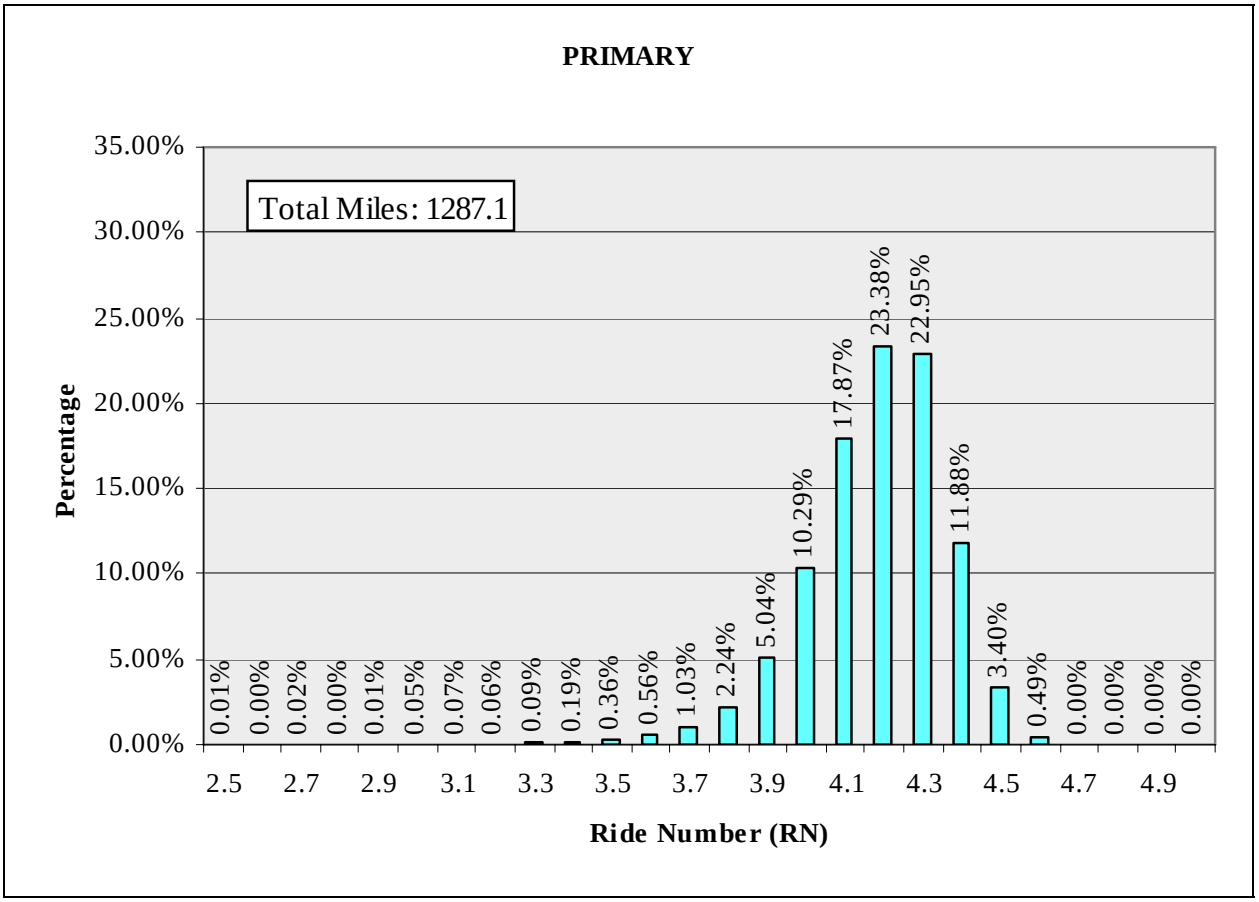

Figure 2 Statewide Ride Distribution, Primary

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	1,287.1	12,871	2.2	4.2	4.6	0.19	67	6.7

Secondary

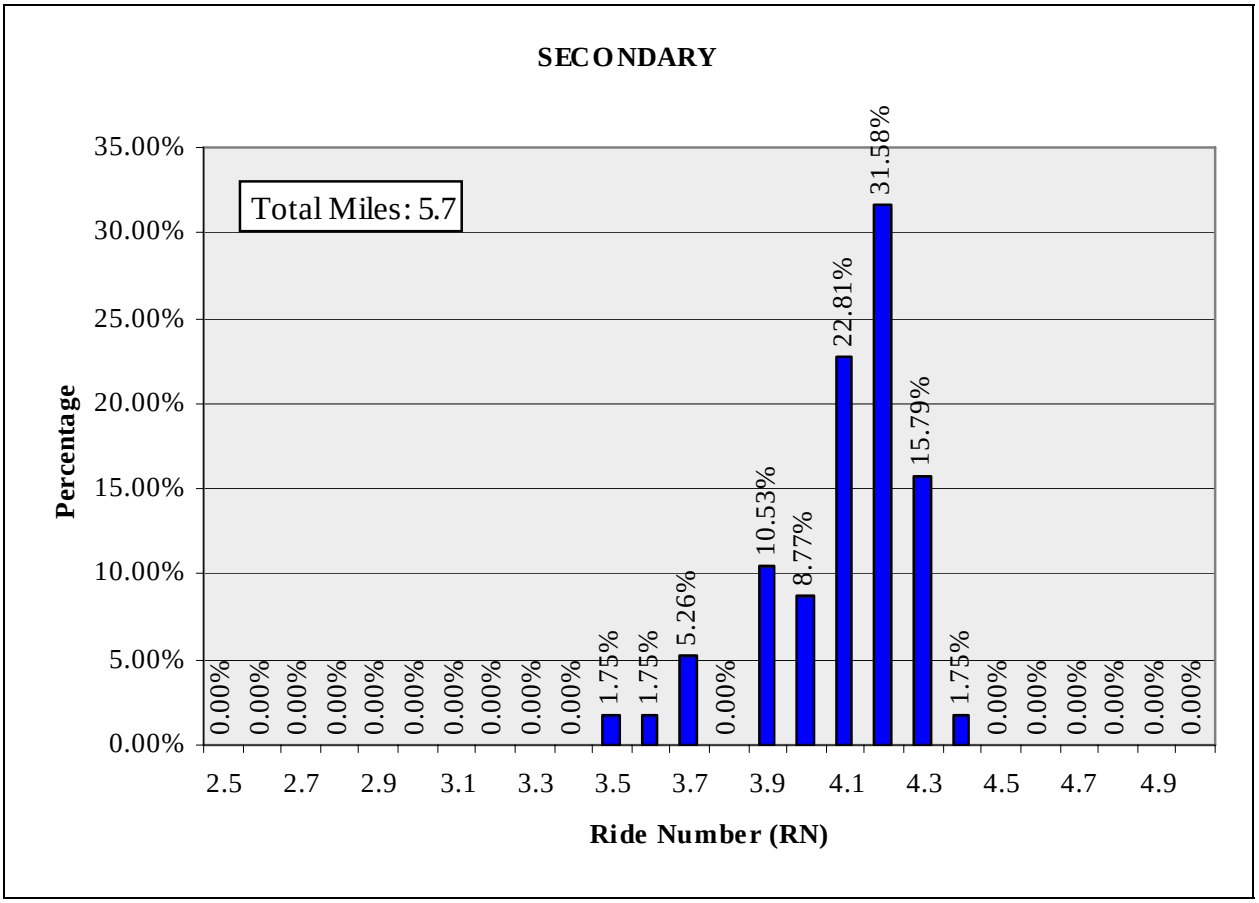

Figure 3 Statewide Ride Distribution, Secondary

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Secondary	5.7	57	3.5	4.1	4.4	0.19	0	0

Toll Roads

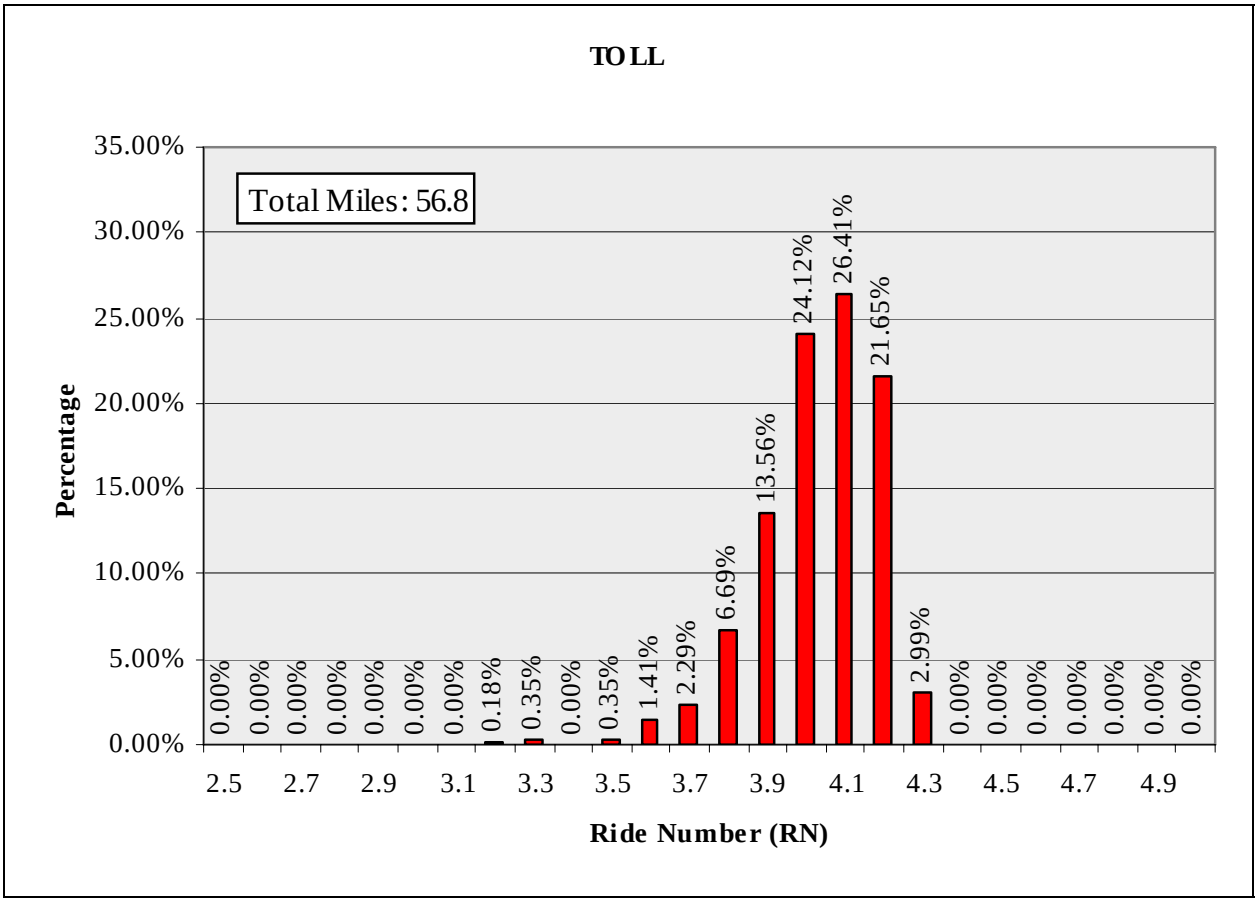

Figure 4 Statewide Ride Distribution, Toll Roads

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Toll	56.8	568	3.2	4.0	4.3	0.16	3	0.3

Interstate

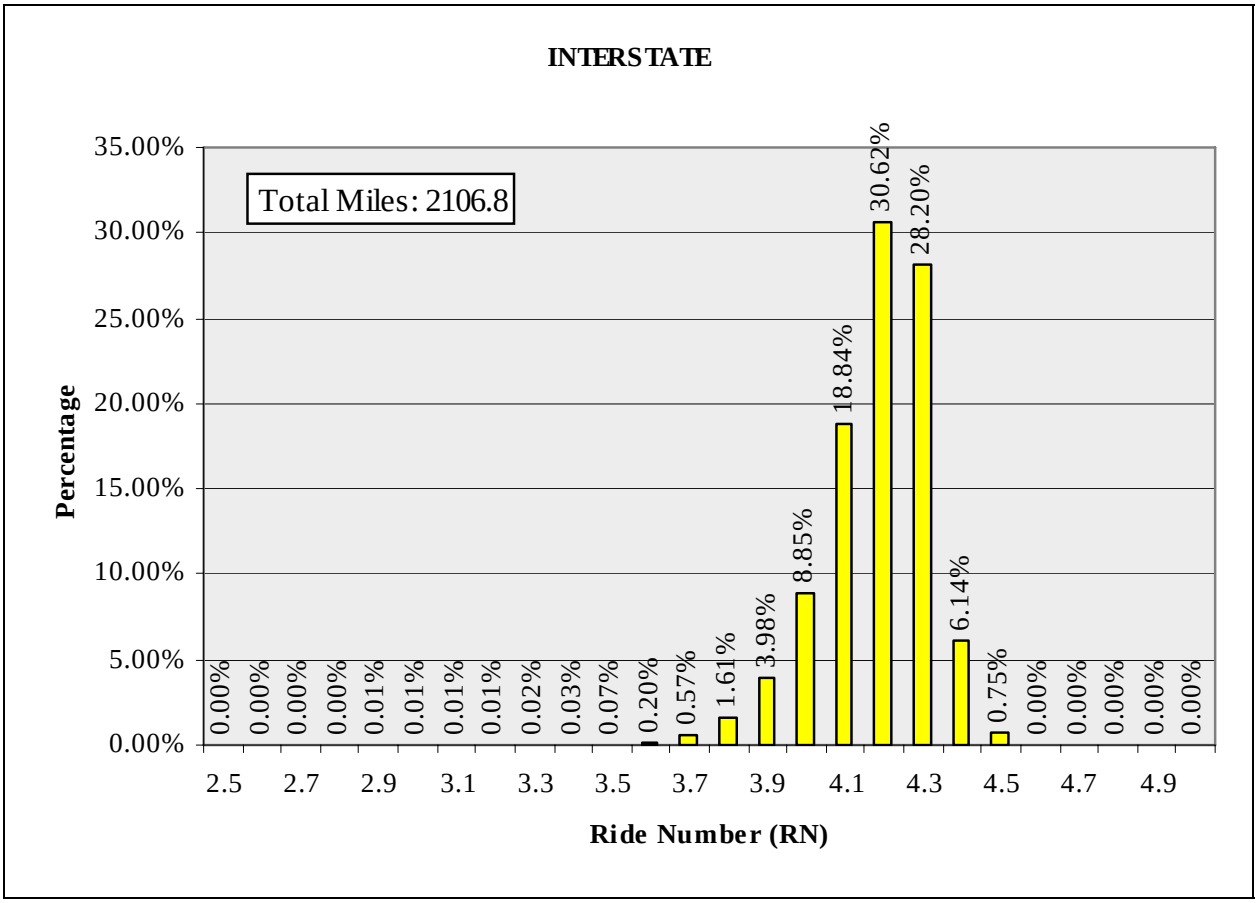

Figure 5 Statewide Ride Distribution, Interstate

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Interstate	2,106.8	21,068	1.4	4.2	4.5	0.16	33	3.3

Turnpike

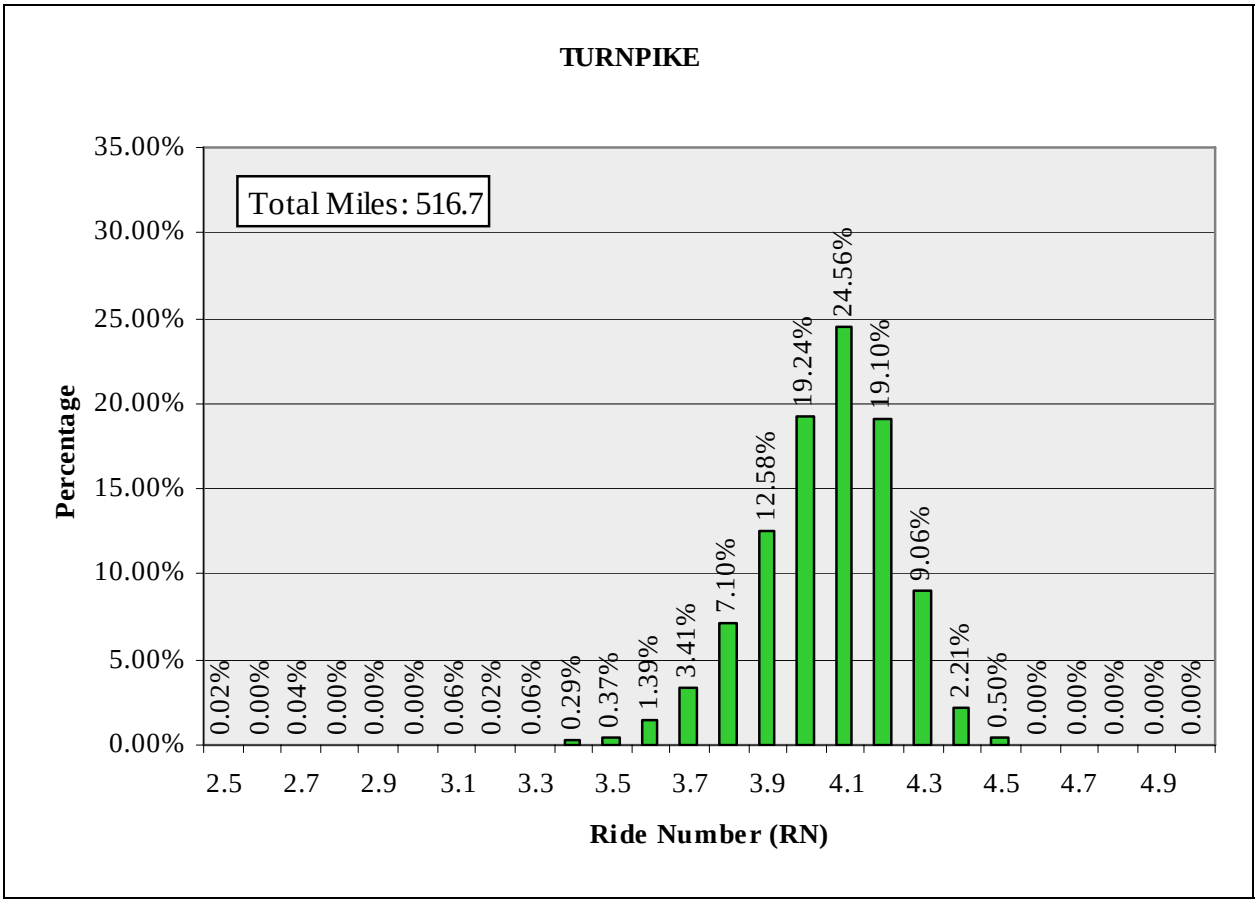

Figure 6 Statewide Ride Distribution, Turnpike

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Turnpike	516.7	5,167	2.5	4.1	4.5	0.18	25	2.5

Ride Distribution by Friction Course Type

FC 12.5

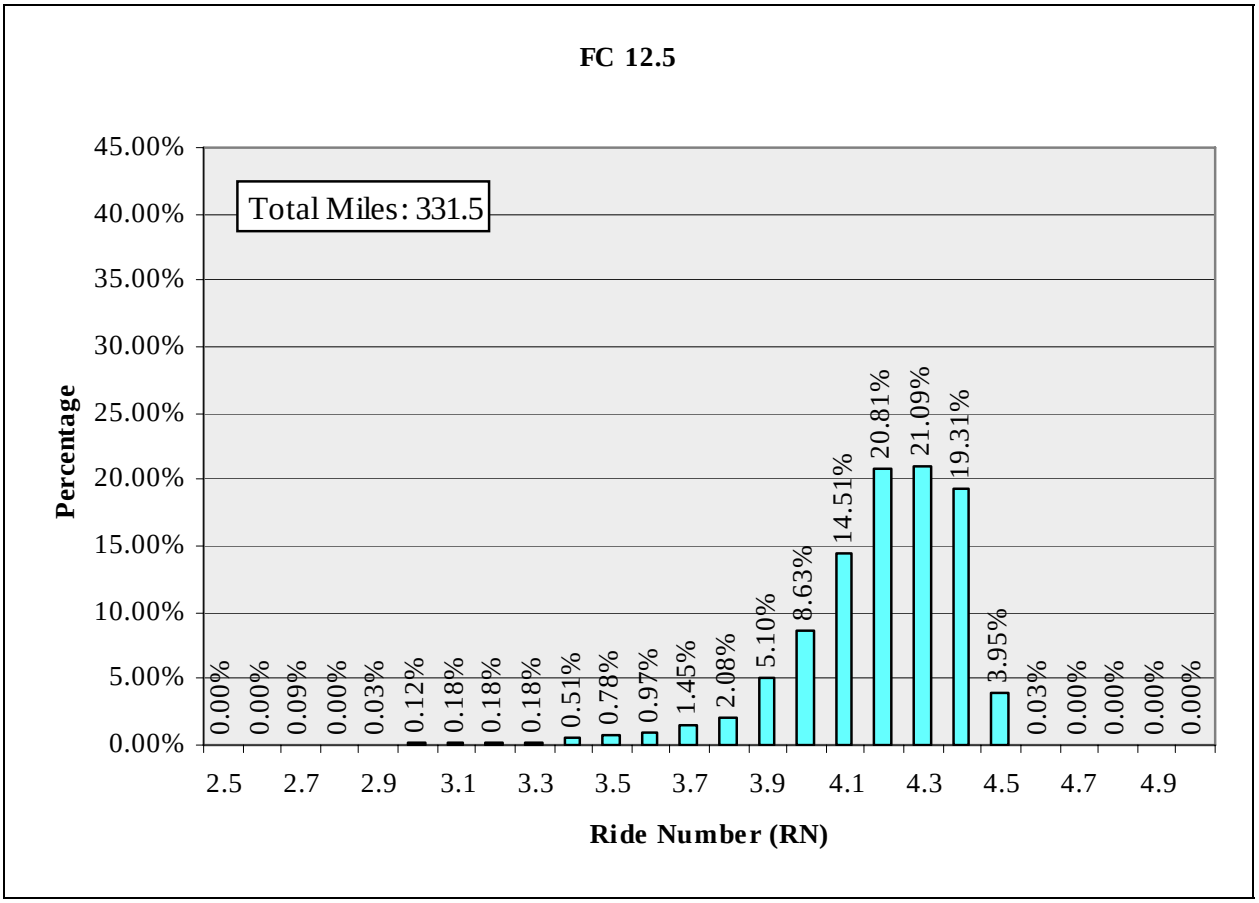

Figure 7 Statewide Ride Distribution, FC 12.5

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	331.5	3,315	2.7	4.2	4.6	0.22	43	4.3

FC 2

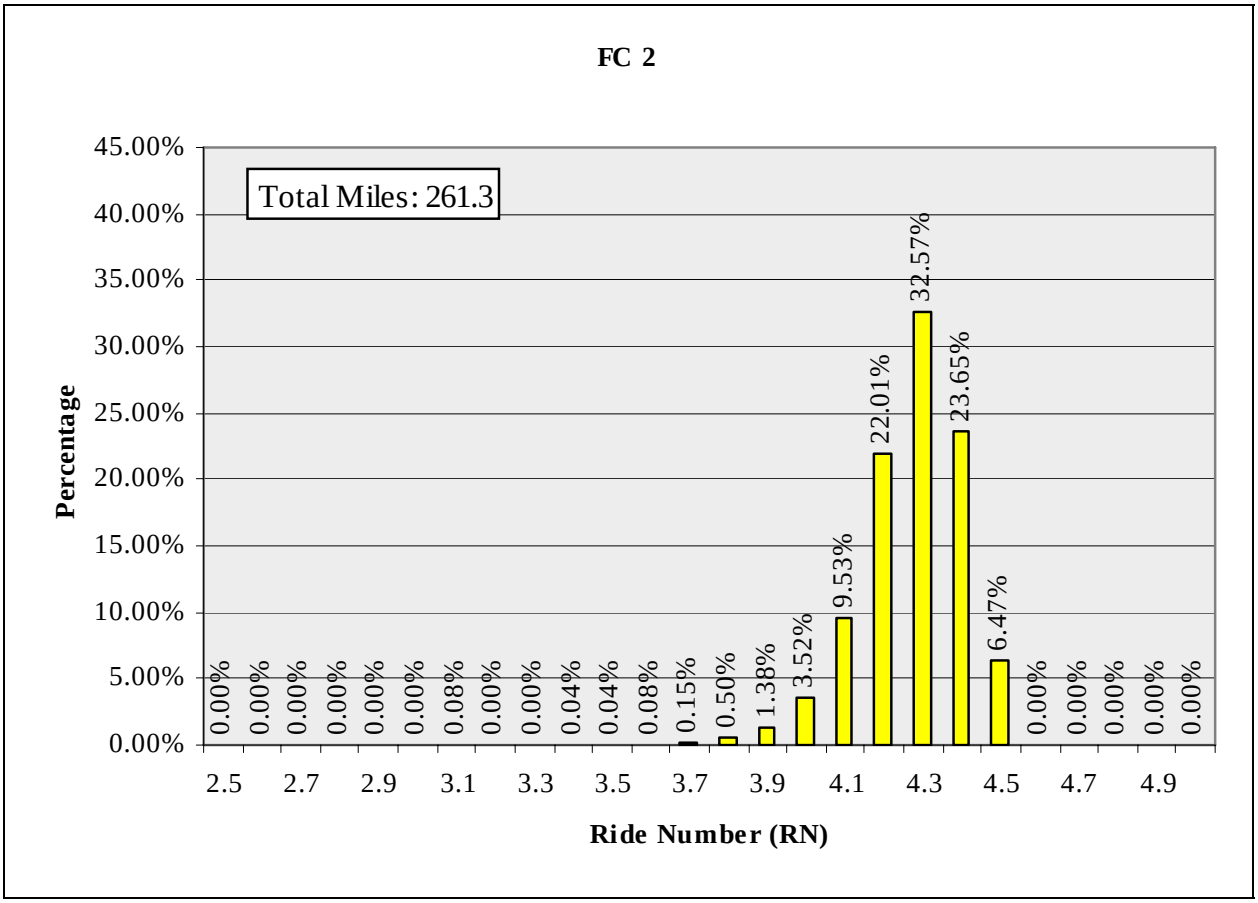

Figure 8 Statewide Ride Distribution, FC 2

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 2	261.3	2,613	3.1	4.3	4.5	0.14	3	0.3

FC 3

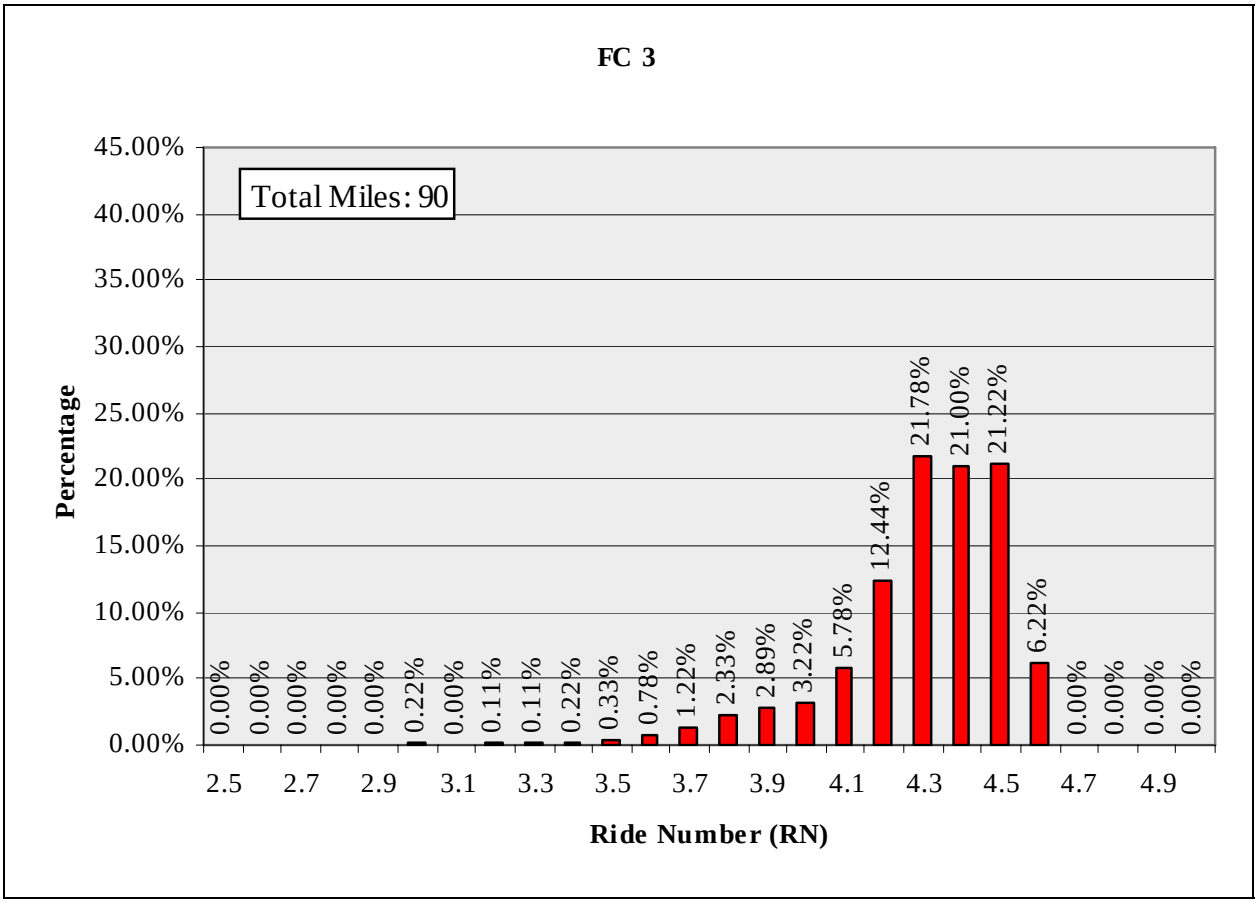

Figure 9 Statewide Ride Distribution, FC 3

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 3	90.0	900	2.4	4.3	4.6	0.24	7	0.7

FC 5

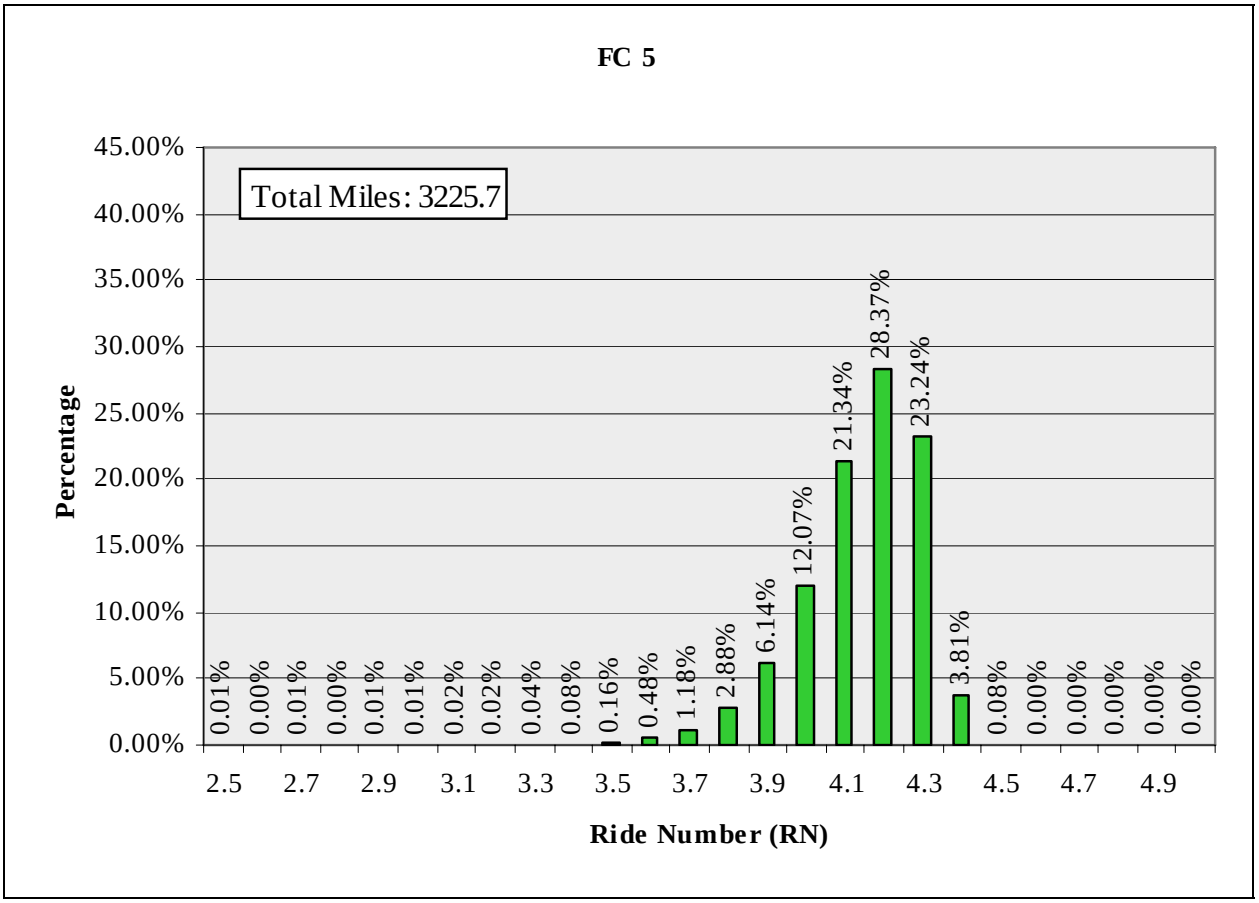

Figure 10 Statewide Ride Distribution, FC 5

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 5	3,225.7	32,257	1.4	4.1	4.5	0.17	75	7.5

FC 9.5

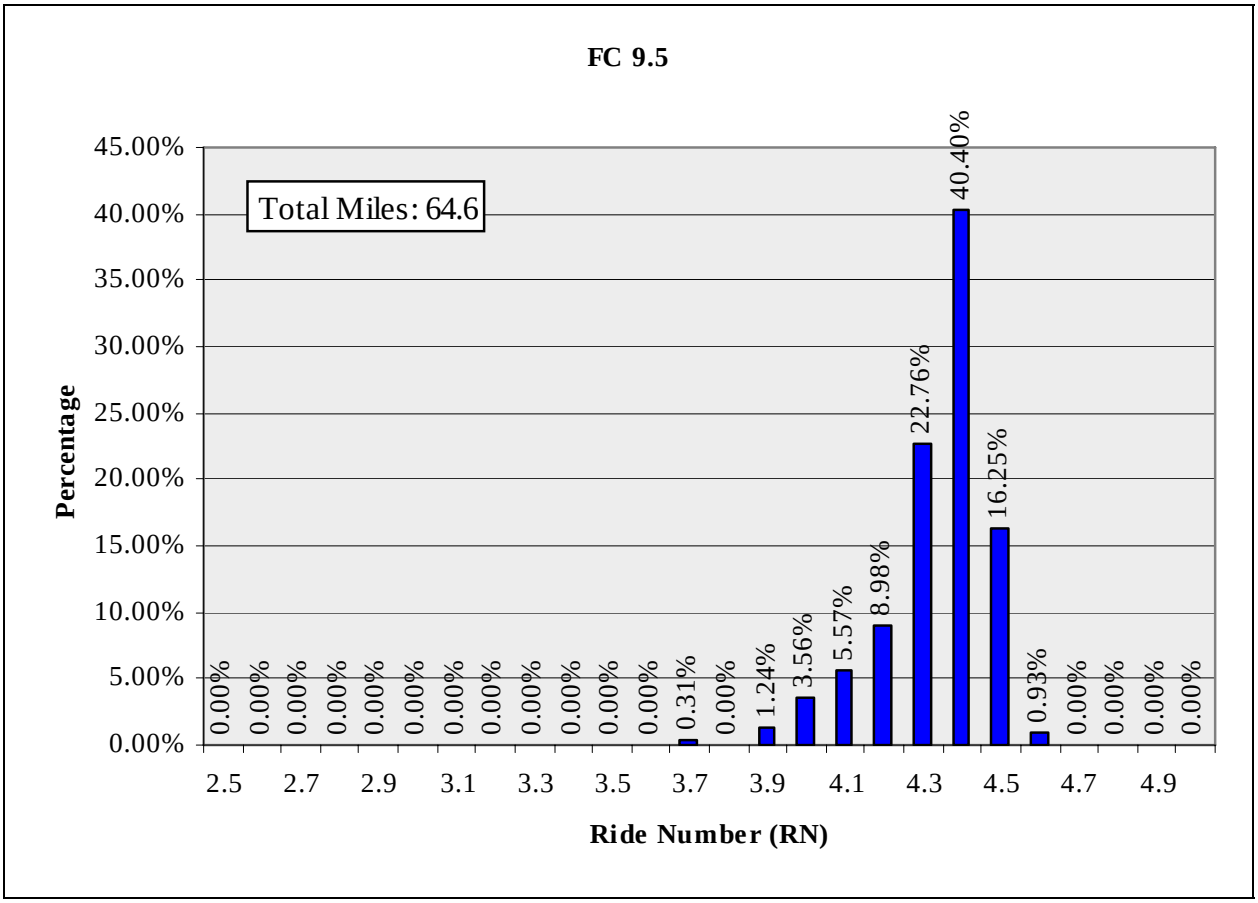

Figure 11 Statewide Ride Distribution, FC 9.5

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 9.5	64.6	646	3.7	4.3	4.6	0.14	0	0

Statewide Statistics

TABLE 1 Statistical Summary for System Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	1,287.1	12,871	2.2	4.2	4.6	0.19	67	6.7
Secondary	5.7	57	3.5	4.1	4.4	0.19	0	0
Toll	56.8	568	3.2	4.0	4.3	0.16	3	0.3
Interstate	2,106.8	21,068	1.4	4.2	4.5	0.16	33	3.3
Turnpike	516.7	5,167	2.5	4.1	4.5	0.18	25	2.5
Statewide	**3,973.1**	**39,731**	**1.4**	**4.1**	**4.6**	**0.18**	**128**	**12.8**

TABLE 2 Statistical Summary for Friction Course Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	331.5	3,315	2.7	4.2	4.6	0.22	43	4.3
FC 2	261.3	2,613	3.1	4.3	4.5	0.14	3	0.3
FC 3	90.0	900	2.4	4.3	4.6	0.24	7	0.7
FC 5	3,225.7	32,257	1.4	4.1	4.5	0.17	75	7.5
FC 9.5	64.6	646	3.7	4.3	4.6	0.14	0	0

TABLE 3 Lane Miles Tested by Friction Course Type

Total Lane Miles Tested								
	District-1	District-2	District-3	District-4	District-5	District-6	District-7	District-8
FC 12.5	66.3	127.2	57.8		80.0		0.2	
FC 2	23.1	31.9			111.4	5.7	76.0	13.2
FC 3		53.3			36.7			
FC 5	270.8	1,305.2	468.9	45.4	470.3	1.8	159.8	503.5
FC 9.5	15.6	44.4			4.6			
Total	**375.8**	**1,562.0**	**526.7**	**45.4**	**703.0**	**7.5**	**236**	**516.7**

Statewide Contractor Statistics

TABLE 4 Statewide Statistical Summary for Contractors

Contractor	Total No of Miles	Total No of Lots	Minimum	Median	Maximum	St. Dev
Anderson Columbia	1,014.7	10,147	1.4	4.2	4.6	0.15
Couch	171.7	1,717	3.1	4.3	4.4	0.11
Hubbard	78.4	784	2.9	4.2	4.4	0.18
Ranger	213.5	2,135	2.4	4.2	4.5	0.19
Redland	5.7	57	3.5	4.1	4.4	0.19
White	171.7	1,717	3.1	4.3	4.5	0.11
Macasphalt	196.7	1,967	3.2	4.1	4.5	0.17
J.B.Coxwell	84.3	843	3.7	4.2	4.4	0.09
C.A.Meyers	13.2	132	3.8	4.3	4.5	0.13
Whitehurst	117.8	1,178	3.0	4.2	4.6	0.18
D.A.B	68.1	681	2.5	4.2	4.6	0.2
A.P.A.C	422.1	4,221	3.1	4.1	4.6	0.18
Orlando Paving	170.6	1,706	3.2	4.1	4.5	0.21
Atlantic Coast	68.6	686	3.6	4.2	4.4	0.12
Felix Equities	36.1	361	3.5	4.2	4.4	0.12
Community Asphalt	100.0	1,000	3.3	4.0	4.3	0.16
Ajax Paving Ind.	119.8	1,198	3.0	4.2	4.5	0.18
Peavey & Sons	38.9	389	2.7	4.0	4.3	0.18
C.W. Roberts	94.0	940	2.7	4.2	4.5	0.24
Sandco Inc.	26.0	260	4.1	4.3	4.5	0.07
Pave Tech	61.9	619	3.8	4.3	4.4	0.08
East Coast Paving	31.7	317	3.1	3.9	4.1	0.14
Milestone Southern Paving	79.8	798	3.7	4.1	4.3	0.14

H.I.P.	10.0	100	3.8	4.2	4.4	0.12
Hardrives of Delray	10.2	102	3.6	4.0	4.3	0.13
Dickerson Asphalt	25.0	250	3.5	4.1	4.2	0.12
General Asphalt	1.8	18	3.9	4.0	4.1	0.05
J.W.Conner & Sons	33.0	330	3.6	4.2	4.4	0.12
Better Roads Inc.	49.0	490	3.9	4.4	4.5	0.07
Elmo Greer	77.8	778	3.5	4.1	4.4	0.14
Bergeron Land Development Inc.	59.7	597	3.4	3.9	4.3	0.13
P & S Paving	188.9	1,889	2.2	4.2	4.4	0.14
Lane	118.0	1,180	2.5	4.1	4.4	0.13
Martin K. Eby	15.0	150	3.6	4.0	4.2	0.13

District

1

1.1 District 1 Ride Distribution

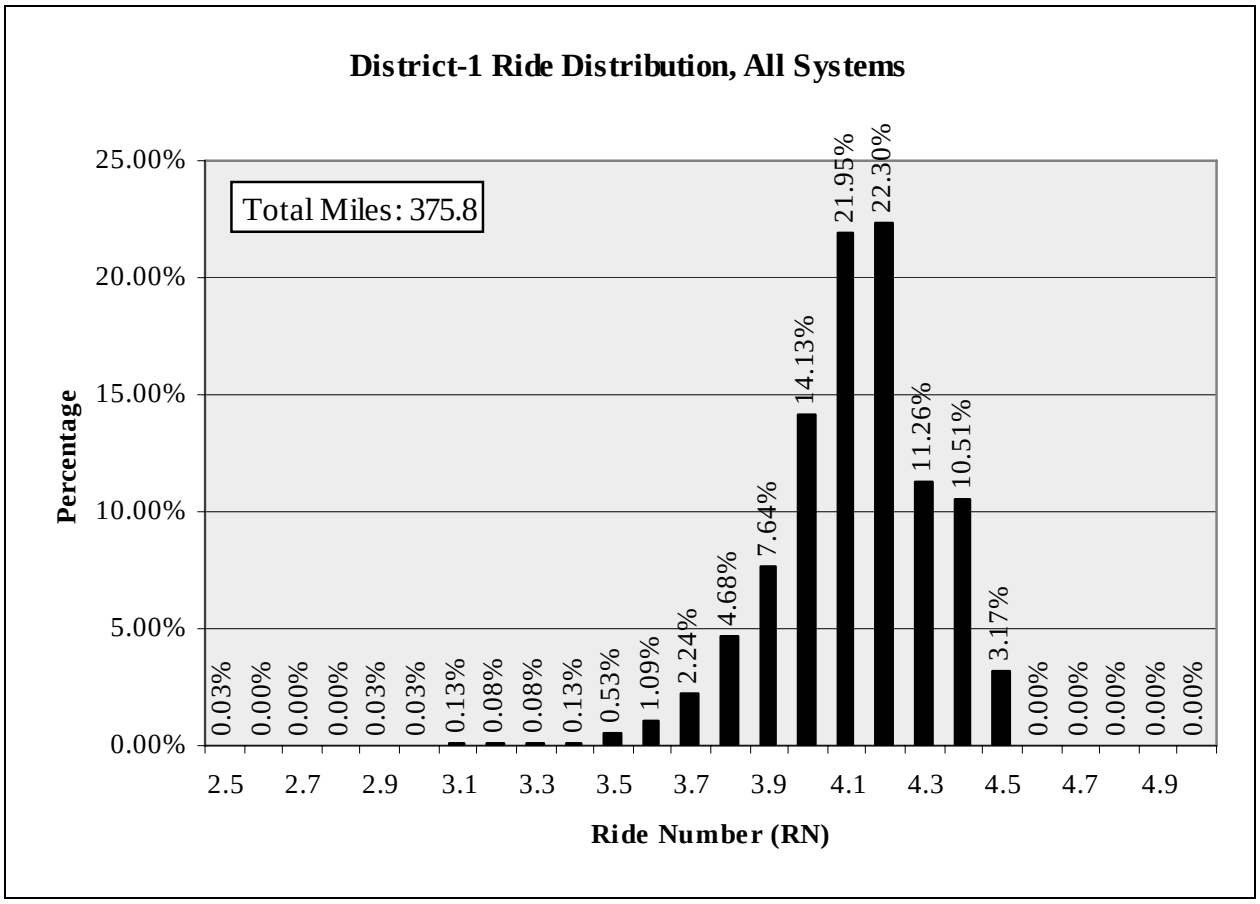

Figure 12 Ride Distribution, District 1, All Systems

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	375.8	3,758	2.5	4.1	4.5	0.20	19	1.9

1.2 Ride Distribution by System Type

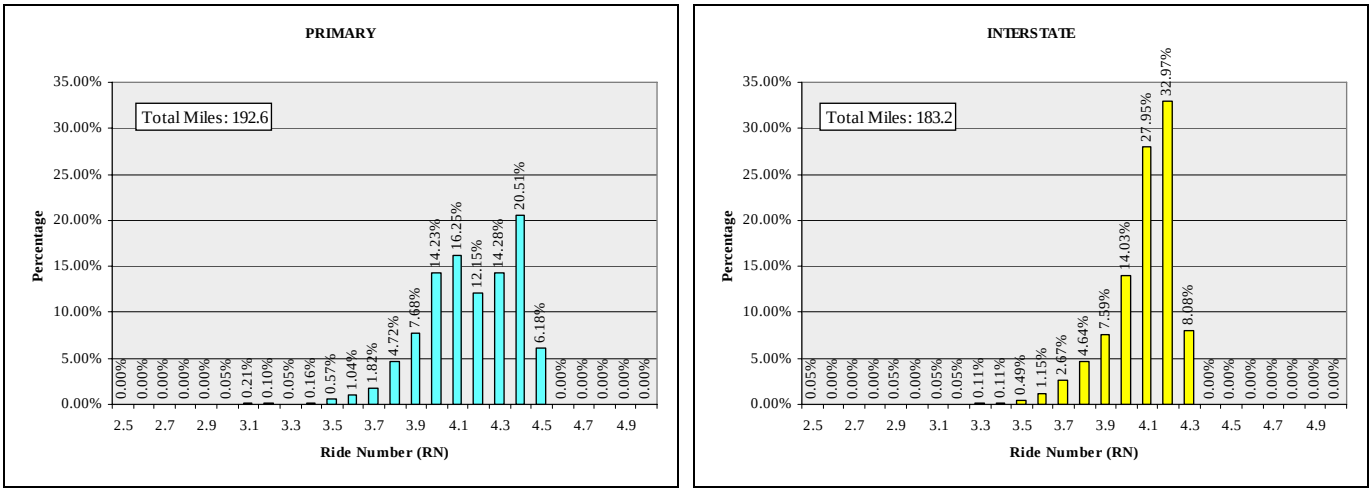

Figure 13 Ride Distribution, District 1, by System Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	192.6	1,926	3.0	4.2	4.5	0.23	11	1.1
Interstate	183.2	1,832	2.5	4.1	4.3	0.17	8	0.8

1.3 Ride Distribution by Friction Course Type

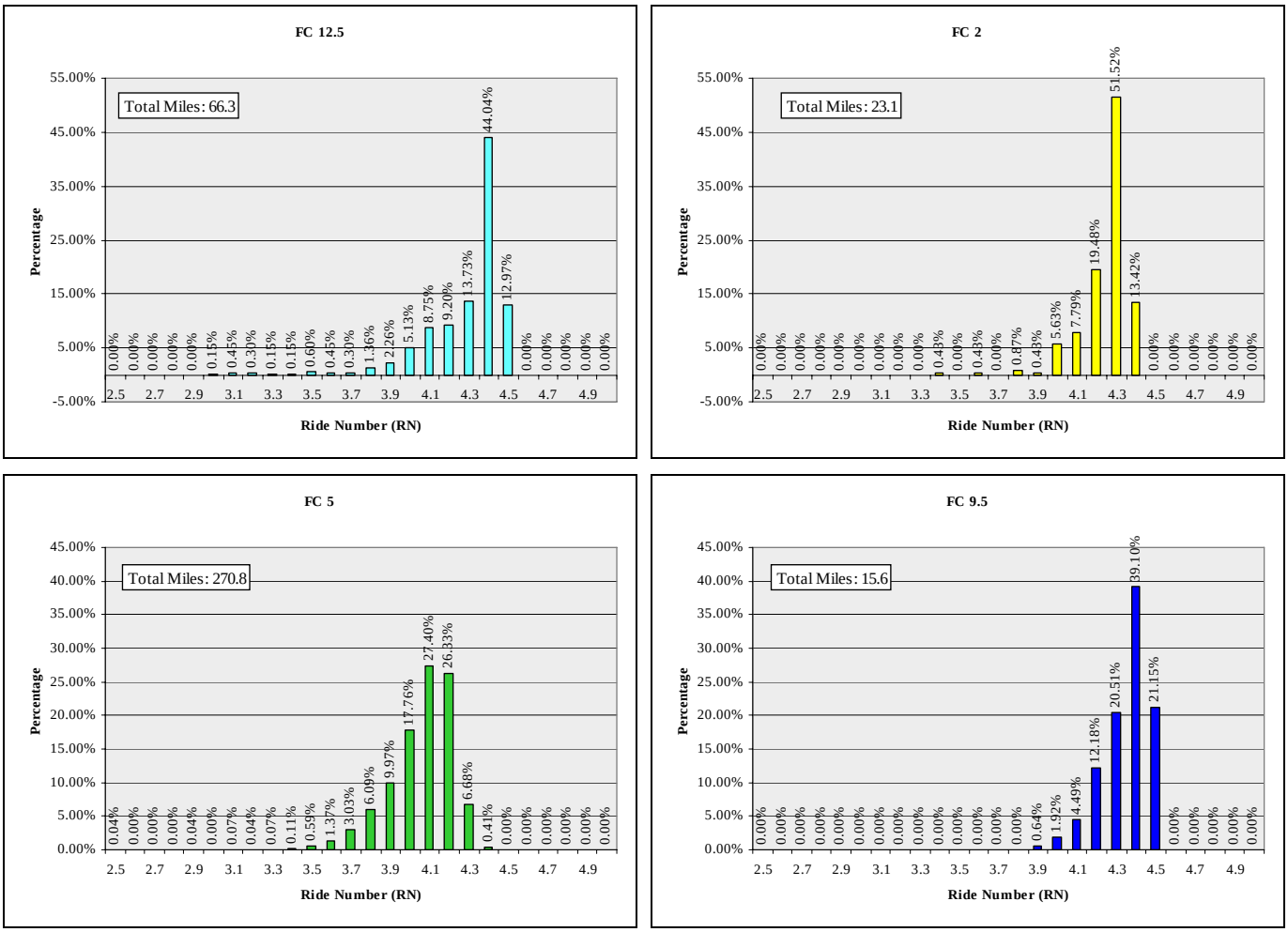

Figure 14 Ride Distribution, District 1, by Friction Course Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	66.3	663	3.0	4.3	4.5	0.22	8	0.8
FC 2	23.1	231	3.4	4.2	4.4	0.13	1	0.1
FC 5	270.8	2,708	2.5	4.1	4.4	0.17	10	1.0
FC 9.5	15.6	156	3.9	4.4	4.5	0.12	0	0

1.4 District 1 Contractor Statistics

TABLE 5 District 1 Contractor Statistics

Contractor	Total No of Miles	Total No of Lots	Minimum	Median	Maximum	St. Dev
A.P.A.C.	96.5	965	3.1	4.1	4.4	0.19
Orlando Paving	53.0	530	3.2	4.0	4.2	0.17
Ajax Paving	59.3	593	3.0	4.2	4.5	0.21
Better Roads	49.0	490	3.9	4.4	4.5	0.07
Lane Construction	118.0	1,180	2.5	4.1	4.4	0.13

District

2

2.1 District 2 Ride Distribution

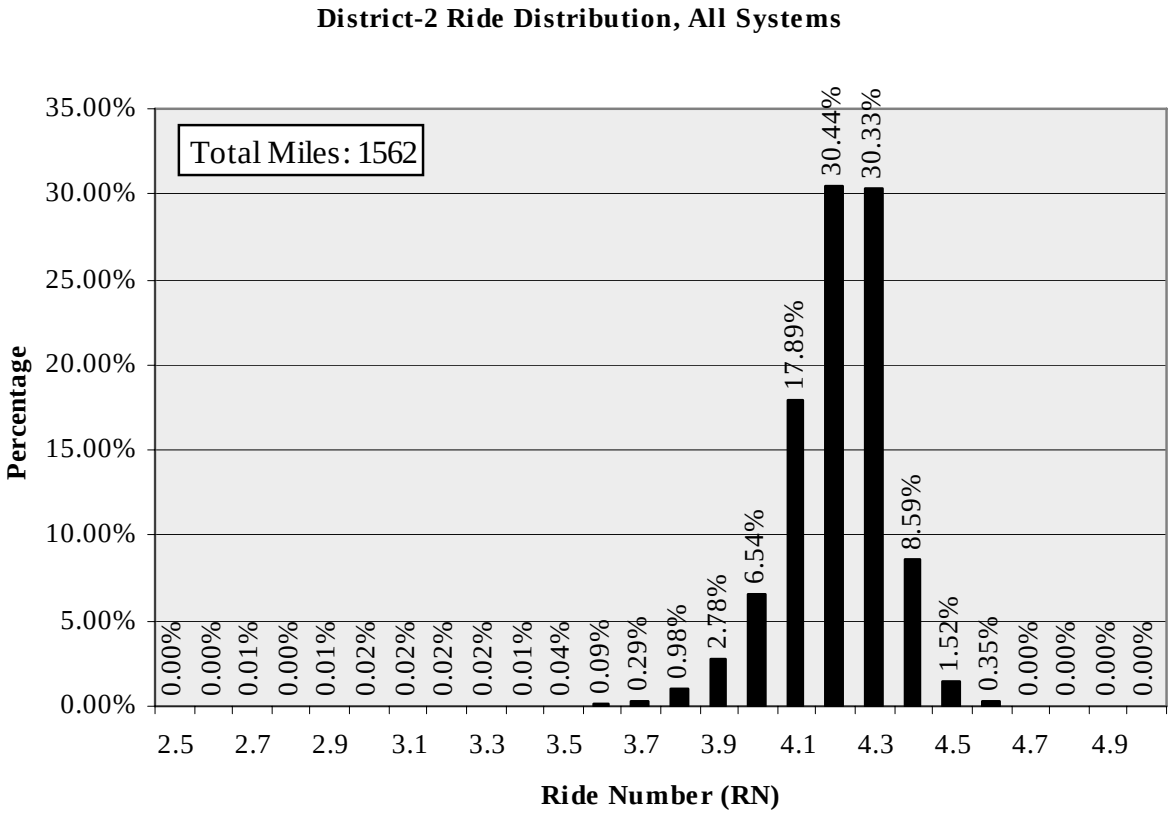

Figure 15 Ride Distribution, District 2, All Systems.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	1,562	15,620	1.4	4.2	4.6	0.15	26	2.6

2.2 Ride Distribution by System Type

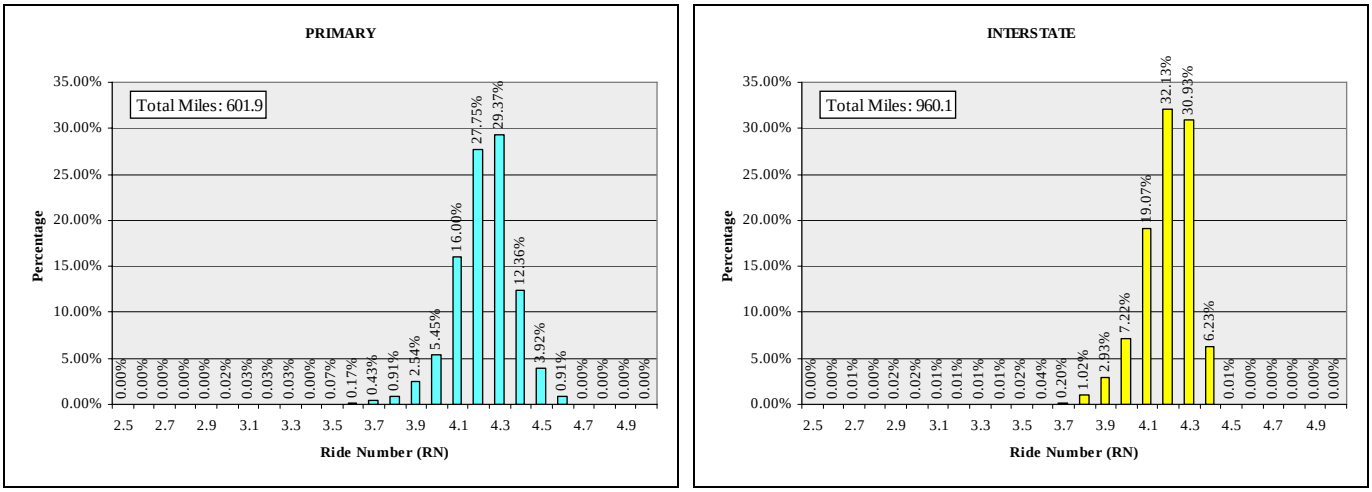

Figure 16 Ride Distribution, District 2, by System Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	601.9	6,019	3.0	4.2	4.6	0.15	7	0.7
Interstate	960.1	9,601	1.4	4.2	4.5	0.15	19	1.9

2.3 Ride Distribution by Friction Course Type

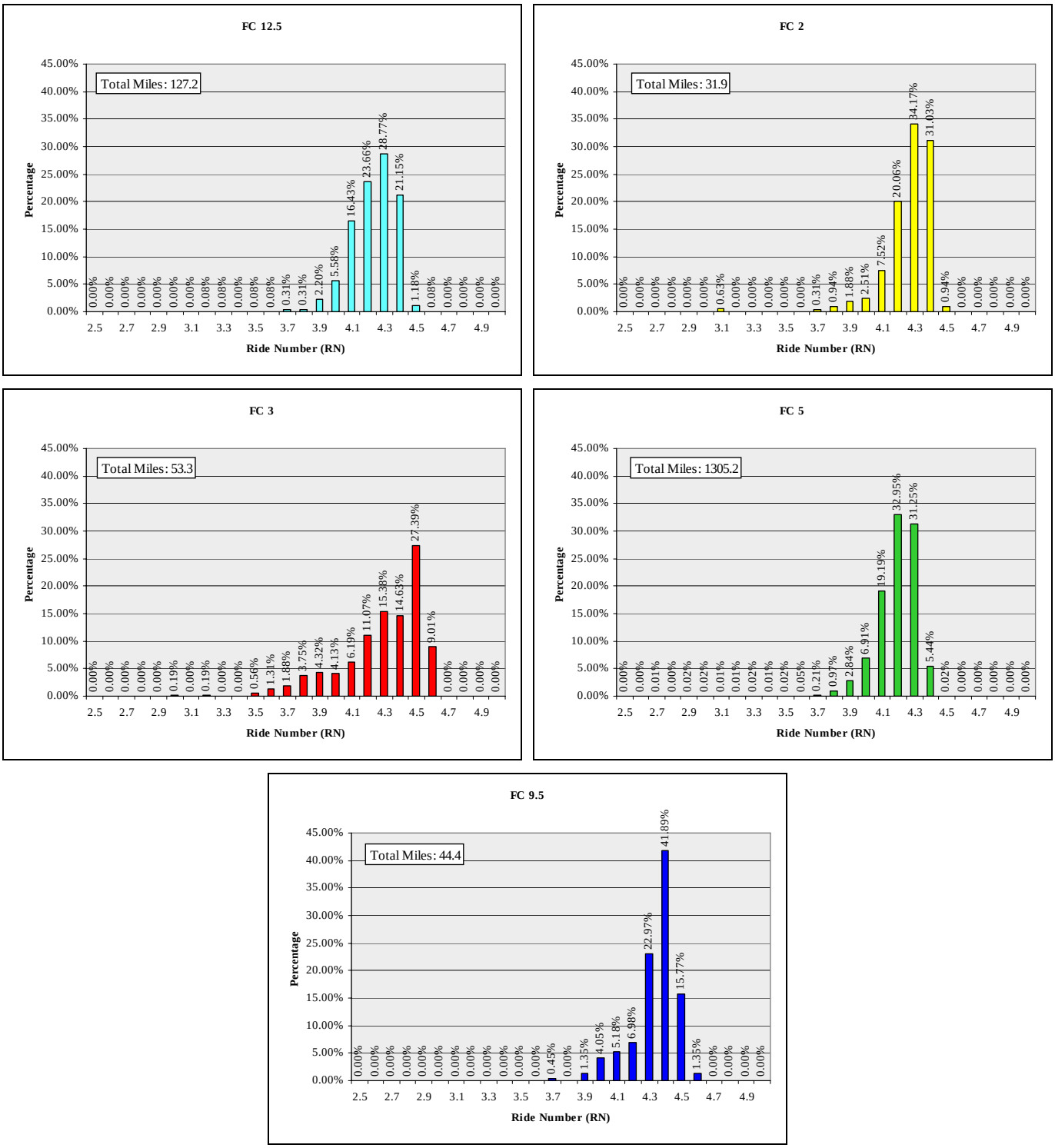

Figure 17 Ride Distribution, by Friction Course.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	127.2	1,272	3.2	4.2	4.6	0.14	2	0.2
FC 2	31.9	319	3.1	4.3	4.5	0.16	2	0.2
FC 3	53.3	533	3.0	4.3	4.6	0.26	2	0.2
FC 5	1,305.2	13,052	1.4	4.2	4.5	0.14	20	2.0
FC 9.5	44.4	444	3.7	4.3	4.6	0.14	0	0

2.4 District 2 Contractor Statistics

TABLE 6 District 2 Contractor Statistics

Contractor	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Anderson Columbia	714.7	7,147	1.4	4.2	4.6	0.16
Couch	108.5	1,085	3.1	4.3	4.4	0.1
Hubbard	67.8	678	2.9	4.2	4.4	0.19
White	143.4	1,434	3.1	4.3	4.5	0.12
J.B.Coxwell	84.3	843	3.7	4.2	4.4	0.09
Whitehurst	117.8	1,178	3.0	4.2	4.6	0.18
A.P.A.C.	103.0	1,030	3.7	4.2	4.6	0.14
Orlando Paving	12.2	122	4.0	4.2	4.3	0.07
Atlantic Coast	68.6	686	3.6	4.2	4.4	0.12
Pave Tech	61.9	619	3.8	4.3	4.4	0.08
Milestone Southern Paving	79.8	798	3.7	4.1	4.3	0.14

District

3

3.1 District 3 Ride Distribution

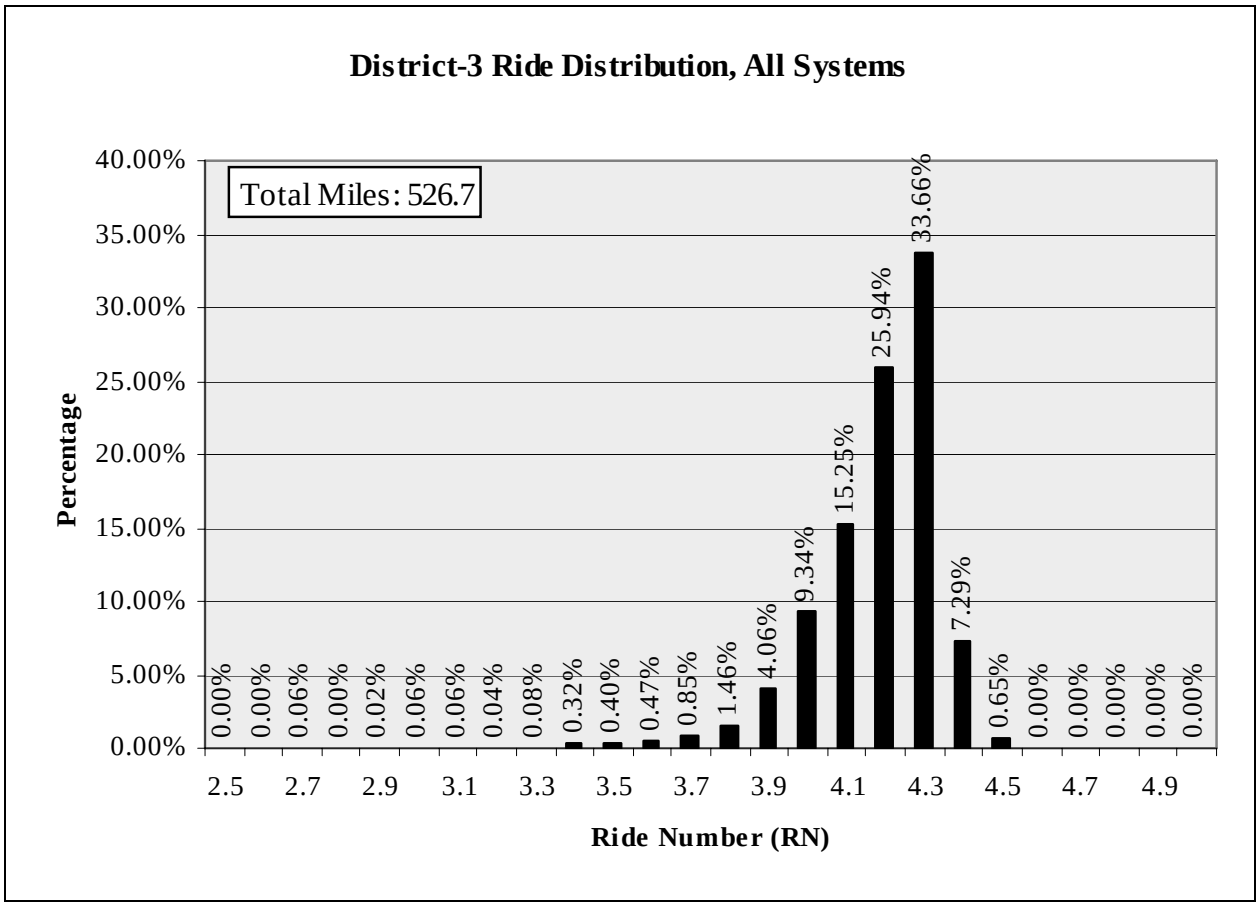

Figure 18 Ride Distribution, District 3, All Systems

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	526.7	5,267	2.7	4.2	4.5	0.17	33	3.3

3.2 Ride Distribution by System Type

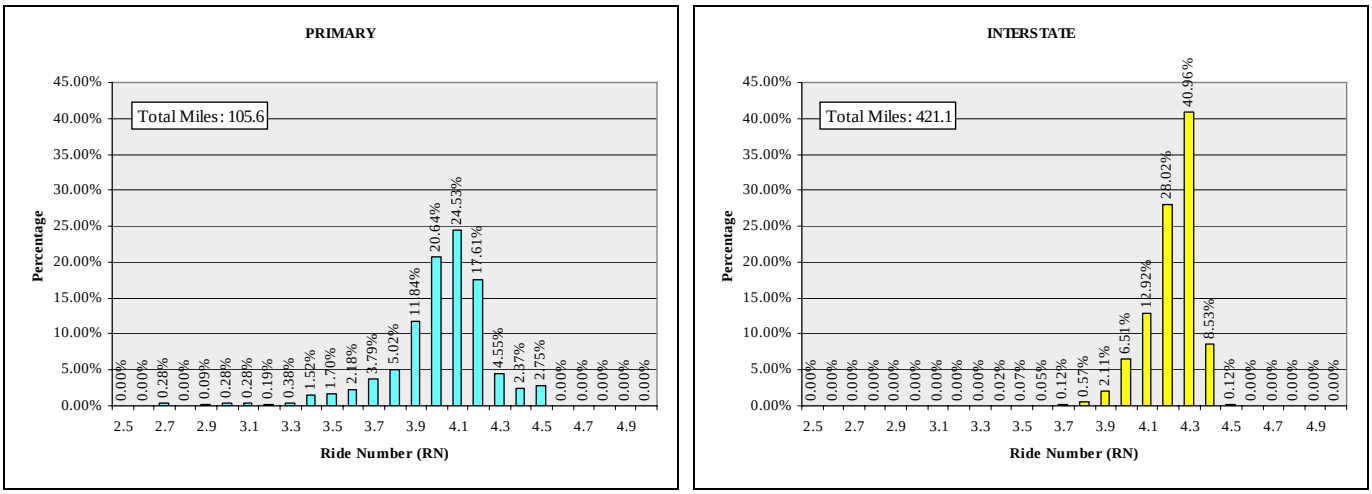

Figure 19 Ride Distribution, District 3, by System Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	105.6	1,056	2.7	4.0	4.5	0.24	32	3.2
Interstate	421.1	4,211	3.4	4.2	4.5	0.12	1	0.1

3.3 Ride Distribution by Friction Course Type

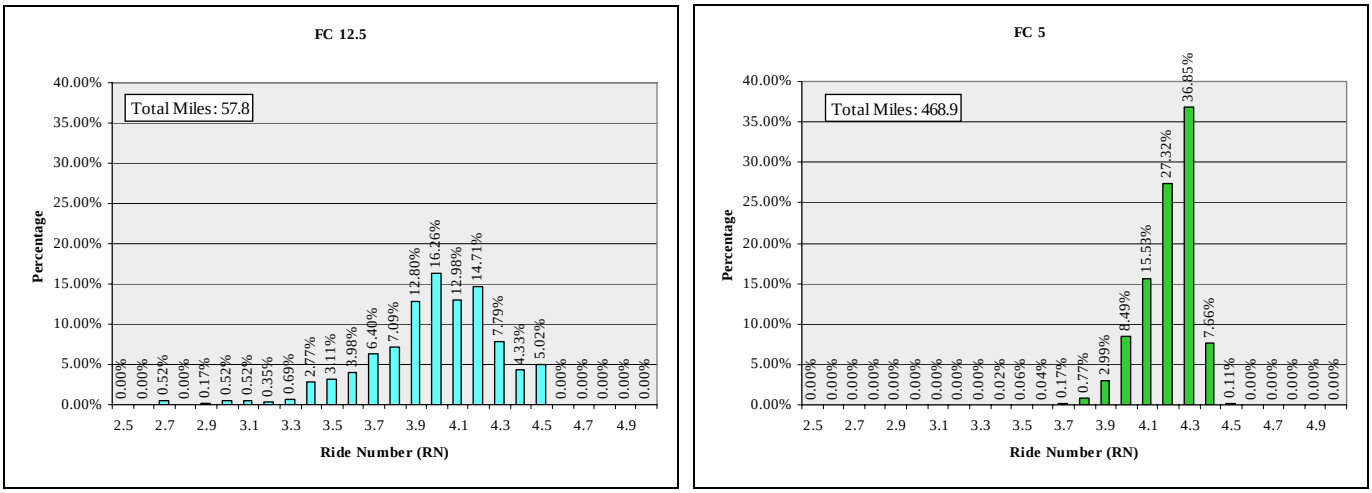

Figure 20 Ride Distribution, District 3, by Friction Course Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	57.8	578	2.7	4.0	4.5	0.31	32	3.2
FC 5	468.9	4,689	3.4	4.2	4.5	0.13	1	0.1

3.4 District 3 Contractor Statistics

TABLE 7 District 3 Contractor Statistics

Contractor	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Anderson Columbia	248.5	2,485	3.4	4.3	4.5	0.12
White	28.3	283	3.7	4.3	4.4	0.07
Macasphalt	18.7	187	3.8	4.1	4.3	0.08
A.P.A.C.	72.9	729	3.4	4.1	4.4	0.13
Peavey & Sons	38.9	389	2.7	4	4.3	0.18
C.W.Roberts	93.4	934	2.7	4.2	4.5	0.24
Sandco Inc.	26.0	260	4.1	4.3	4.5	0.07

District

4

4.1 District 4 Ride Distribution

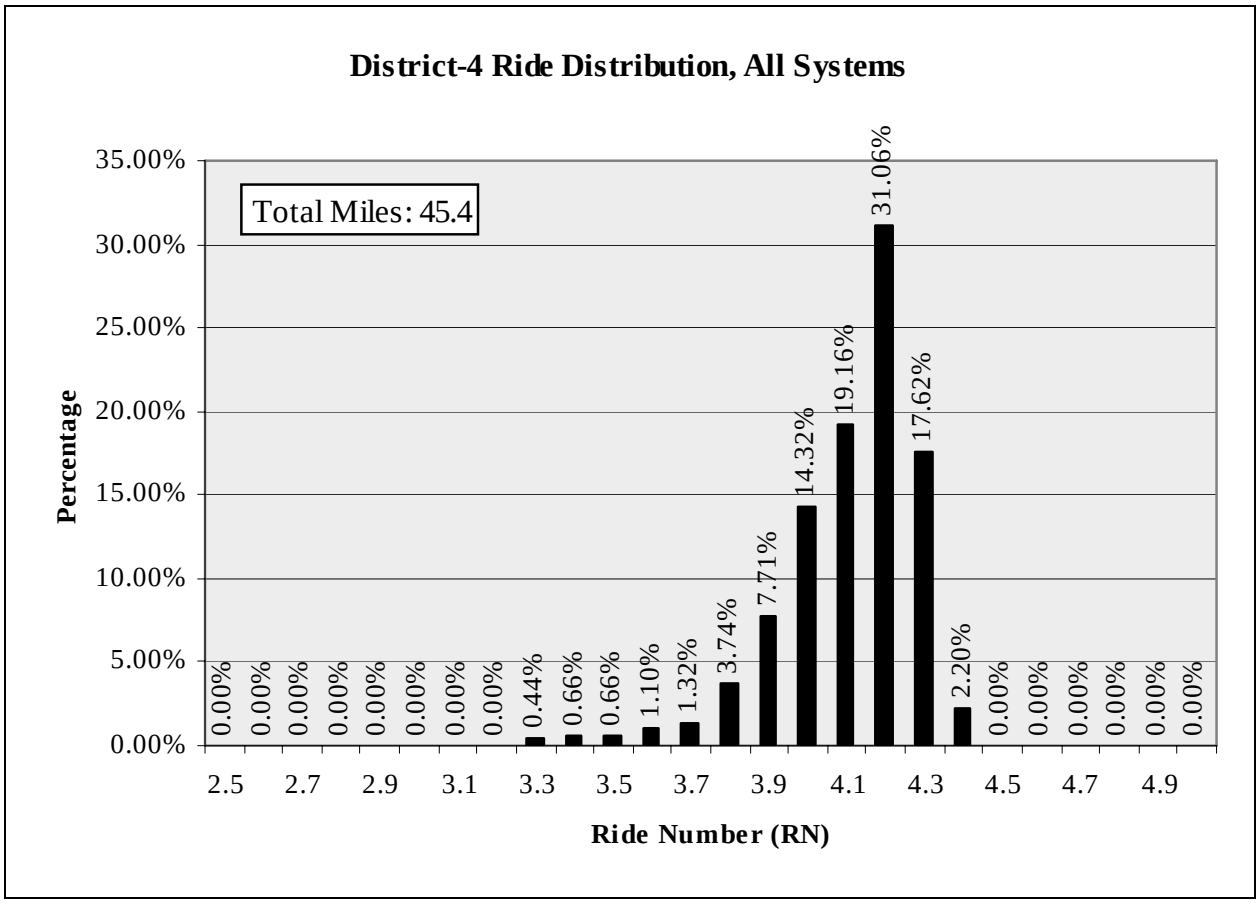

Figure 21 Ride Distribution, District 4, All Systems.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	45.4	454	3.3	4.1	4.4	0.18	5	0.5

4.2 Ride Distribution, by System Type

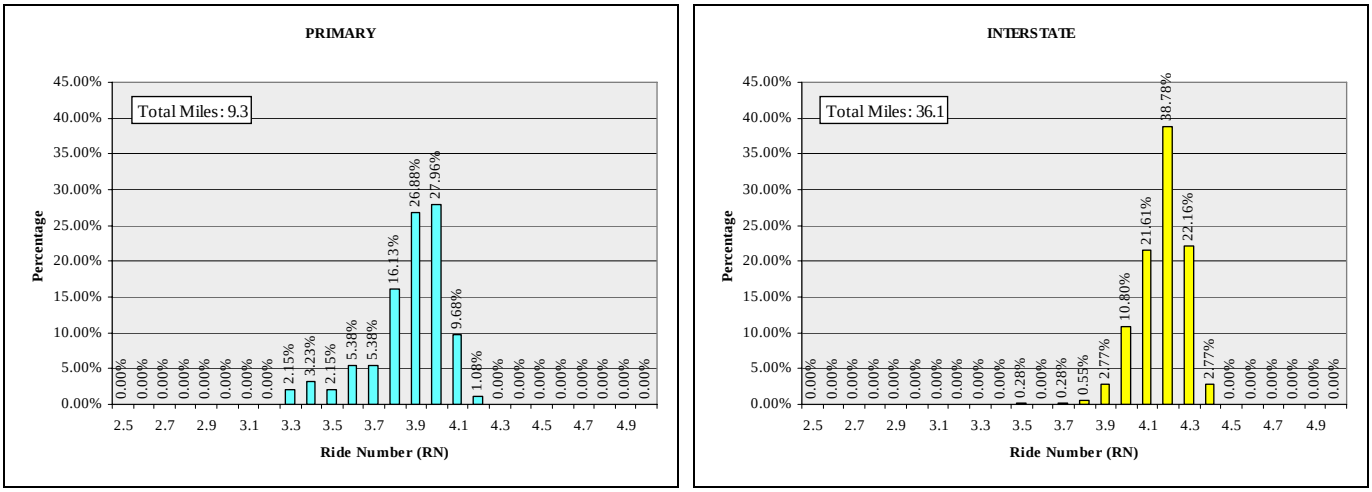

Figure 22 Ride Distribution, District 4, by System Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	9.3	93	3.3	3.9	4.2	0.19	5	0.5
Interstate	36.1	361	3.5	4.2	4.4	0.12	0	0

4.3 Ride Distribution by Friction Course Type

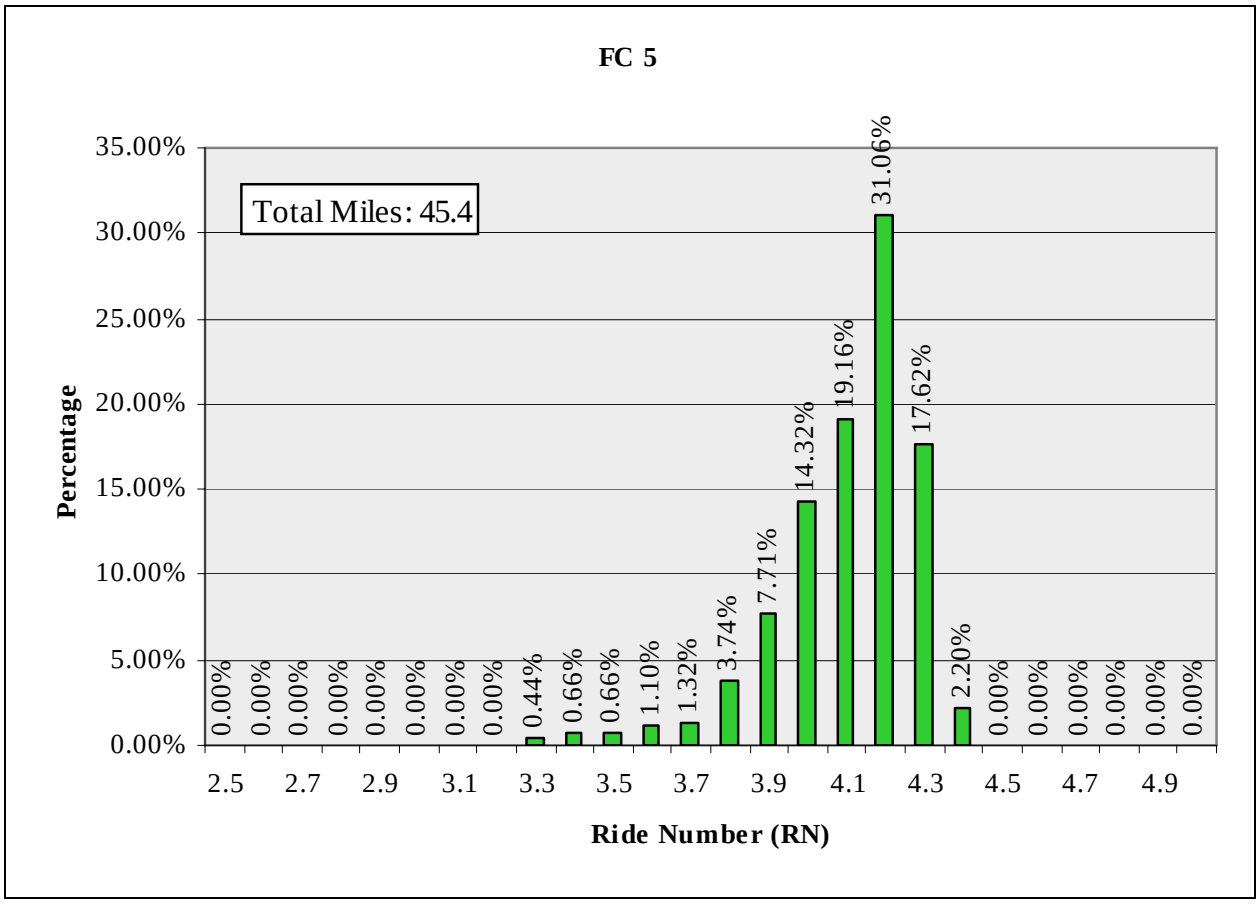

Figure 23 Ride Distribution, District 4, by Friction Course Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 5	45.4	454	3.3	4.2	4.4	0.18	5	0.5

4.4 District 4 Contractor Statistics

TABLE 8 District 4 Contractor Statistics

Contractor	Total No of Miles	Total No of Lots	Minimum	Median	Maximum	St. Dev
Felix Equities	36.1	361	3.5	4.2	4.4	0.12
Community Asphalt	9.3	93	3.3	3.9	4.2	0.19

District

5

5.1 District 5 Ride Distribution

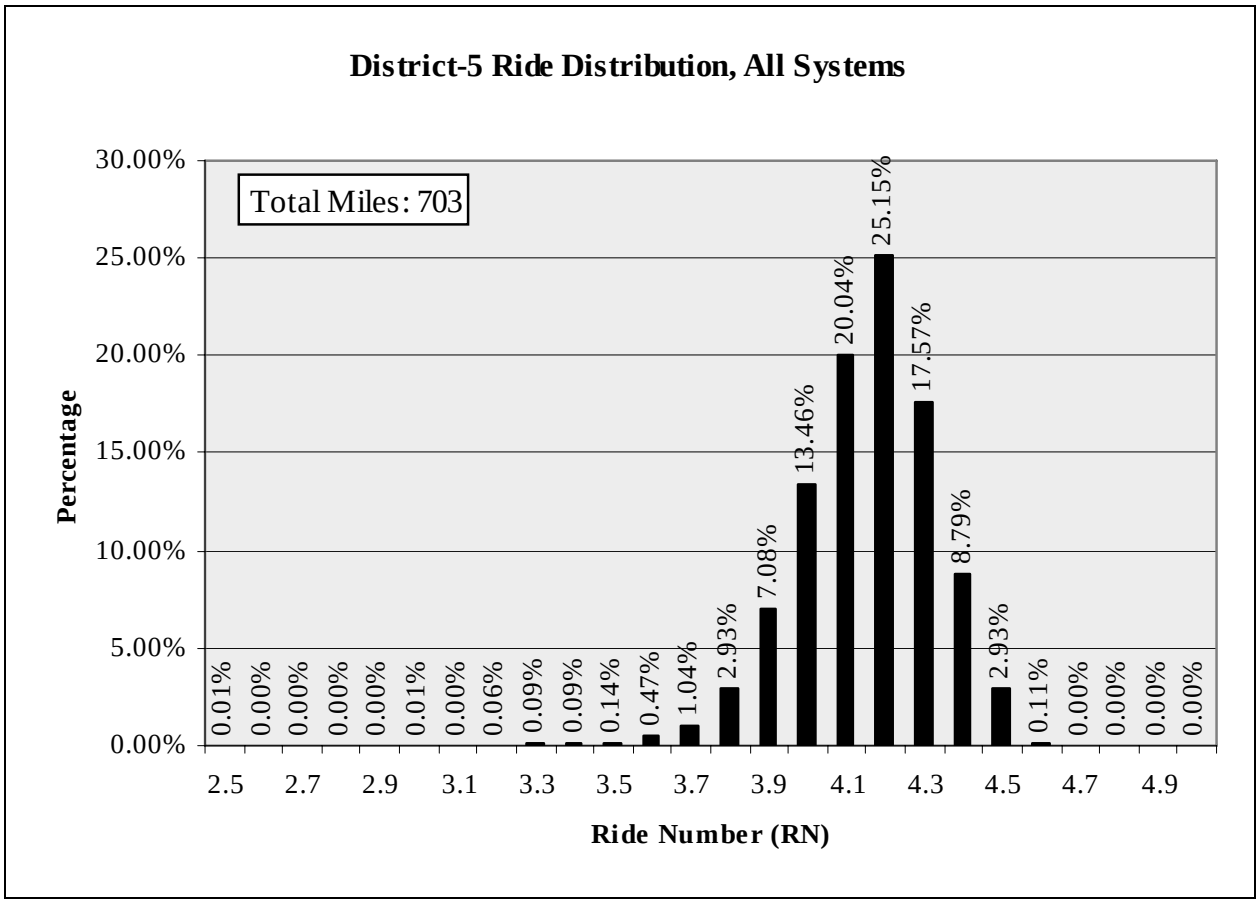

Figure 24 District 5 Ride Distribution, All Systems.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	703.0	7,030	2.2	4.2	4.6	0.18	20	2.0

5.2 Ride Distribution by System Type

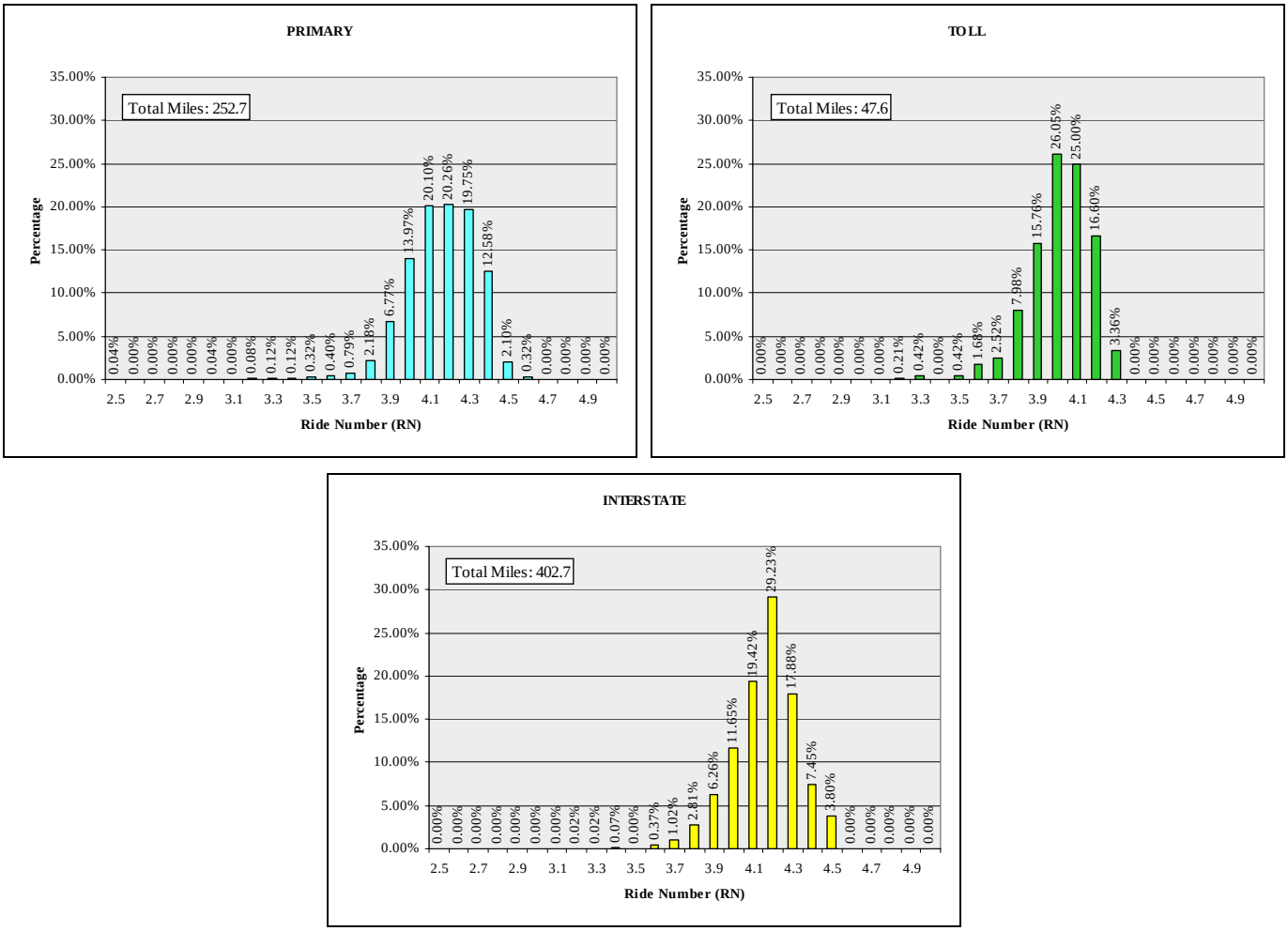

Figure 25 Ride Distribution, District 5, by System Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	252.7	2,527	2.2	4.2	4.6	0.19	12	1.2
Toll	47.6	476	3.2	4.0	4.3	0.16	3	0.3
Interstate	402.7	4,027	3.2	4.2	4.5	0.17	5	0.5

5.3 Ride Distribution by Friction Course Type

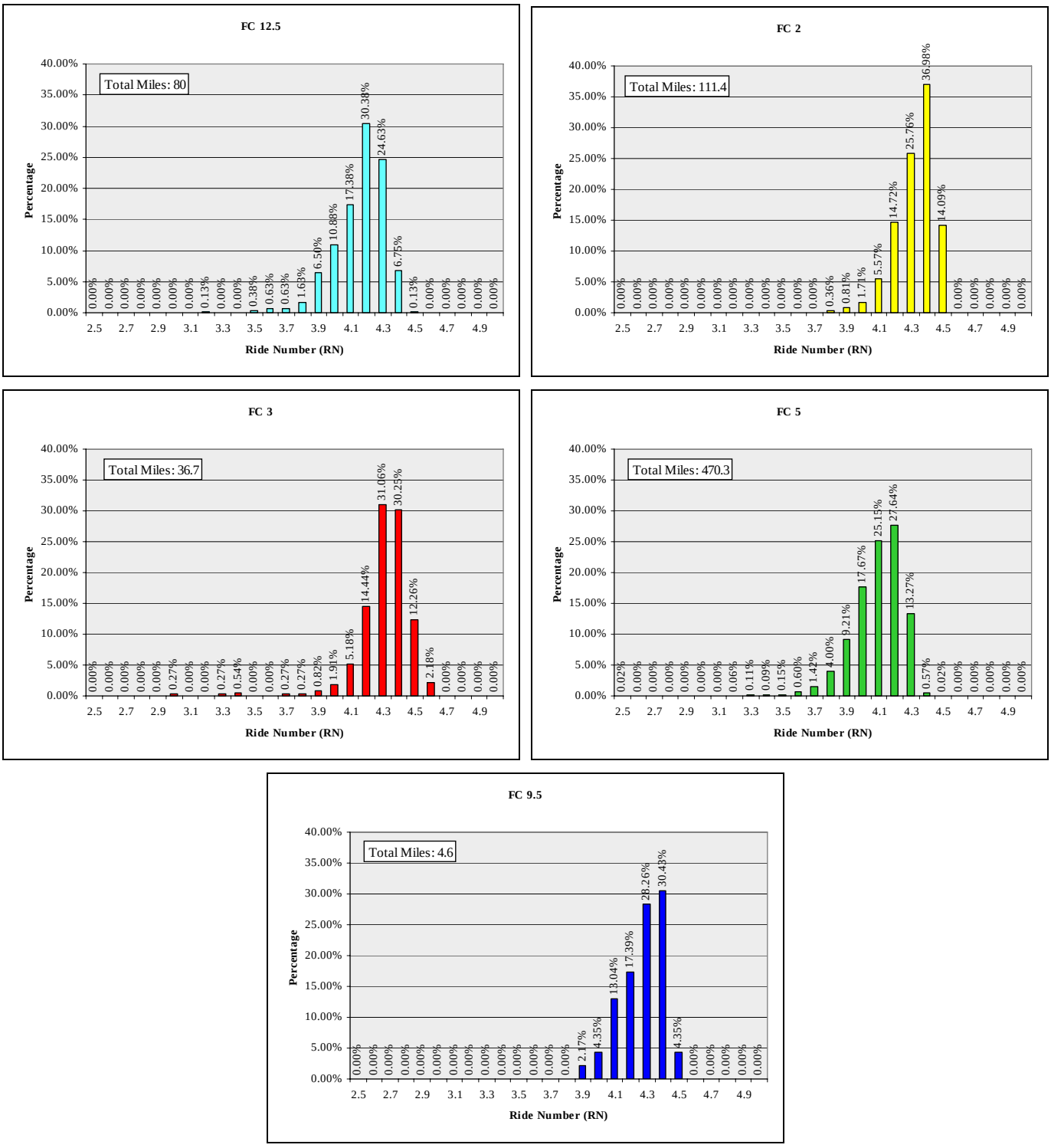

Figure 26 Ride Distribution, District 5, by Friction Course Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	80.0	800	3.2	4.2	4.5	0.16	1	0.1
FC 2	111.4	1,114	3.8	4.3	4.5	0.13	0	0
FC 3	36.7	367	2.4	4.3	4.6	0.2	5	0.5
FC 5	470.3	4,703	2.2	4.1	4.5	0.16	14	1.4
FC 9.5	4.6	46	3.9	4.3	4.5	0.14	0	0

5.4 District 5 Contractor Statistics

TABLE 9 District 5 Contractor Statistics

Contractor	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Anderson Columbia	51.5	515	3.8	4.2	4.4	0.1
Ranger	189.5	1,895	2.4	4.2	4.5	0.2
Macasphalt	144.8	1,448	3.2	4.1	4.5	0.18
D.A.B.	12.4	124	3.8	4.3	4.6	0.18
A.P.A.C.	60.9	609	3.3	4.0	4.3	0.13
Orlando Paving	29.4	294	3.9	4.3	4.5	0.12
C.W.Roberts	0.6	6	4.0	4.3	4.5	0.17
H.I.P.	10.0	100	3.8	4.2	4.4	0.12
P & S Paving	188.9	1,889	2.2	4.1	4.4	0.14
Martin K. Eby	15.0	150	3.6	4.0	4.2	0.13

District

6

6.1 District 6 Ride Distribution

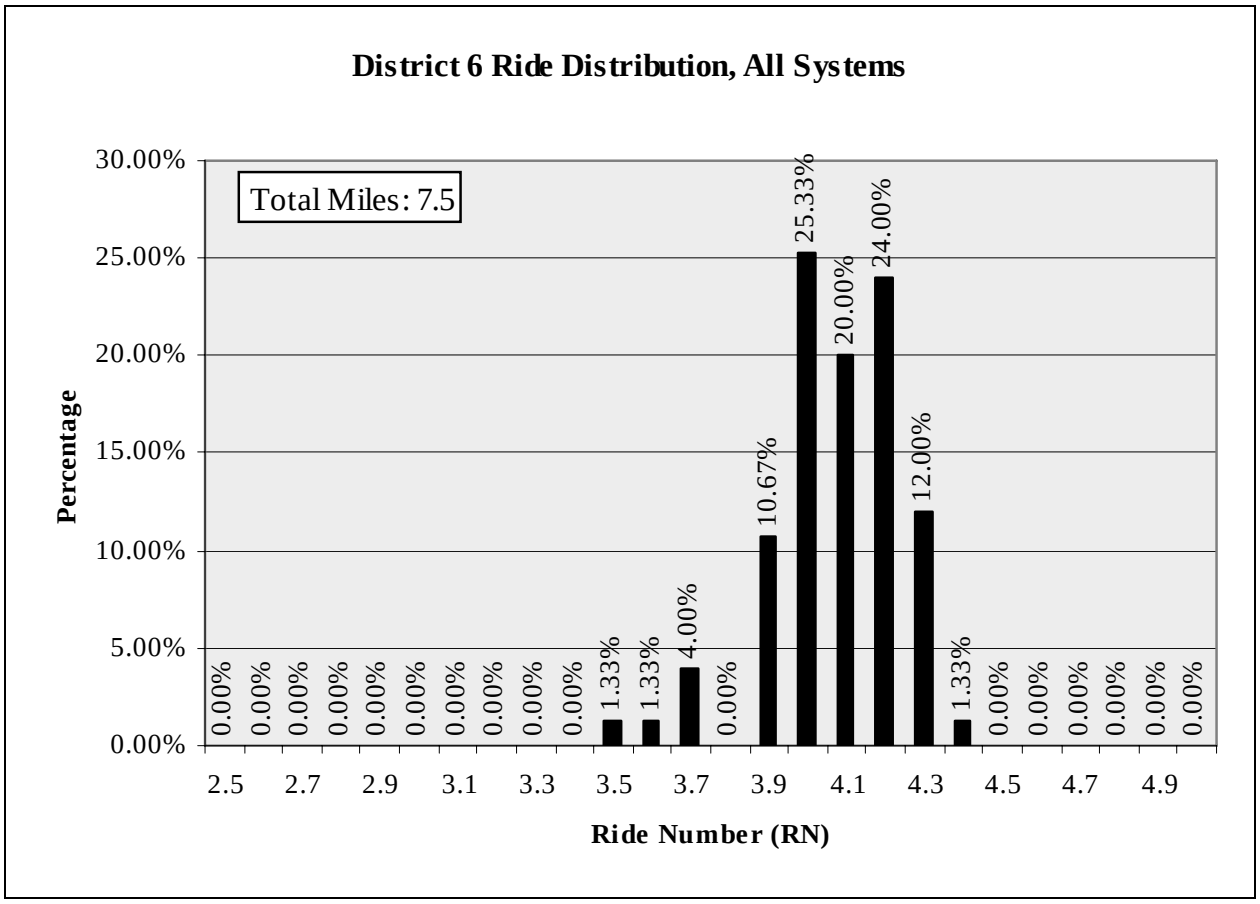

Figure 27 Ride Distribution, District 6, All Systems

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	7.5	75	3.5	4.1	4.4	0.17	0	0

6.2 Ride Distribution by System Type

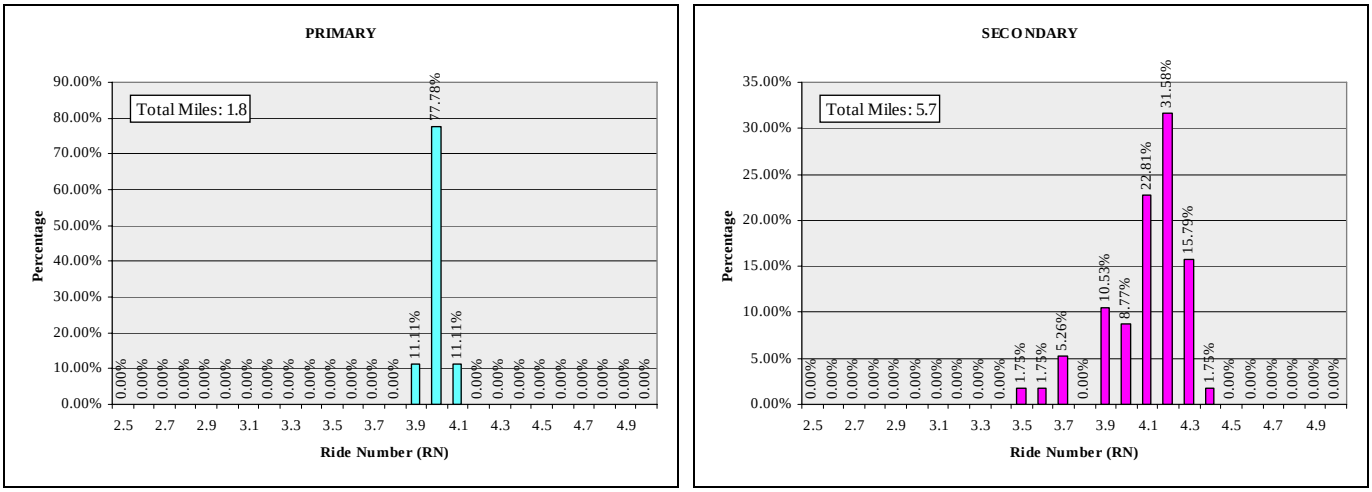

Figure 28 Ride Distribution, District 6, by System Type

Type	Total No of Miles	Total No of Lots	Minimum	Median	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	1.8	18	3.9	4.0	4.1	0.05	0	0
Secondary	5.7	57	3.5	4.1	4.4	0.19	0	0

6.3 Ride Distribution by Friction Course Type

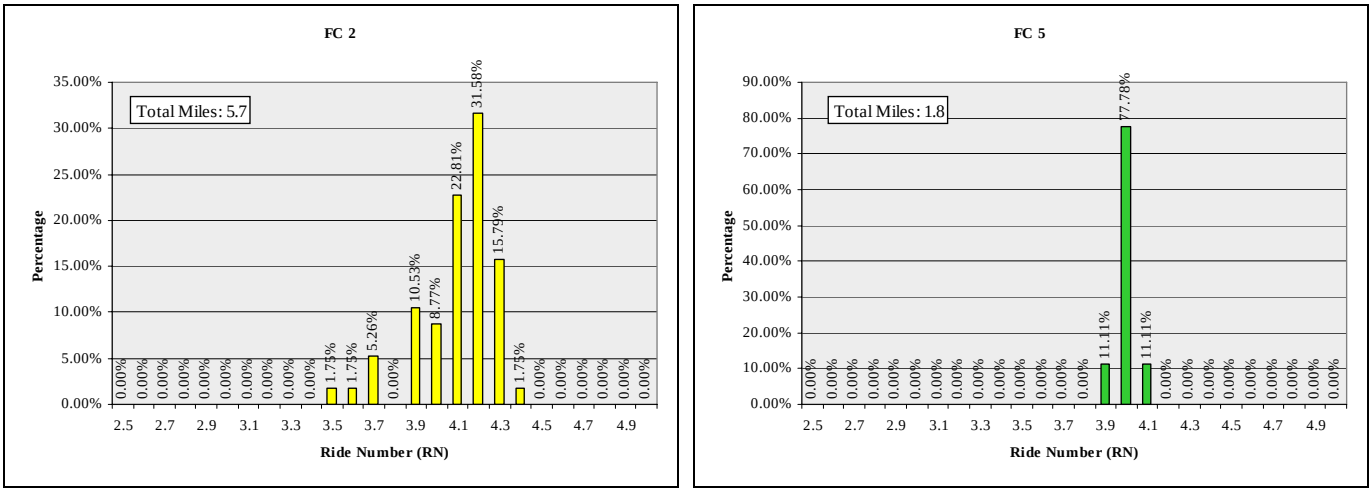

Figure 29 Ride Distribution, District 6, by Friction Course Type.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 2	5.7	57	3.5	4.1	4.4	0.19	0	0
FC 5	1.8	18	3.9	4.0	4.1	0.05	0	0

6.4 District 6 Contractor Statistics

TABLE 10 District 6 Contractor Statistics

Contractor Code No.	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Redland	5.7	57	3.5	4.1	4.4	0.19
General Asphalt	1.8	18	3.9	4	4.1	0.05

District

7

7.1 District 7 Ride Distribution

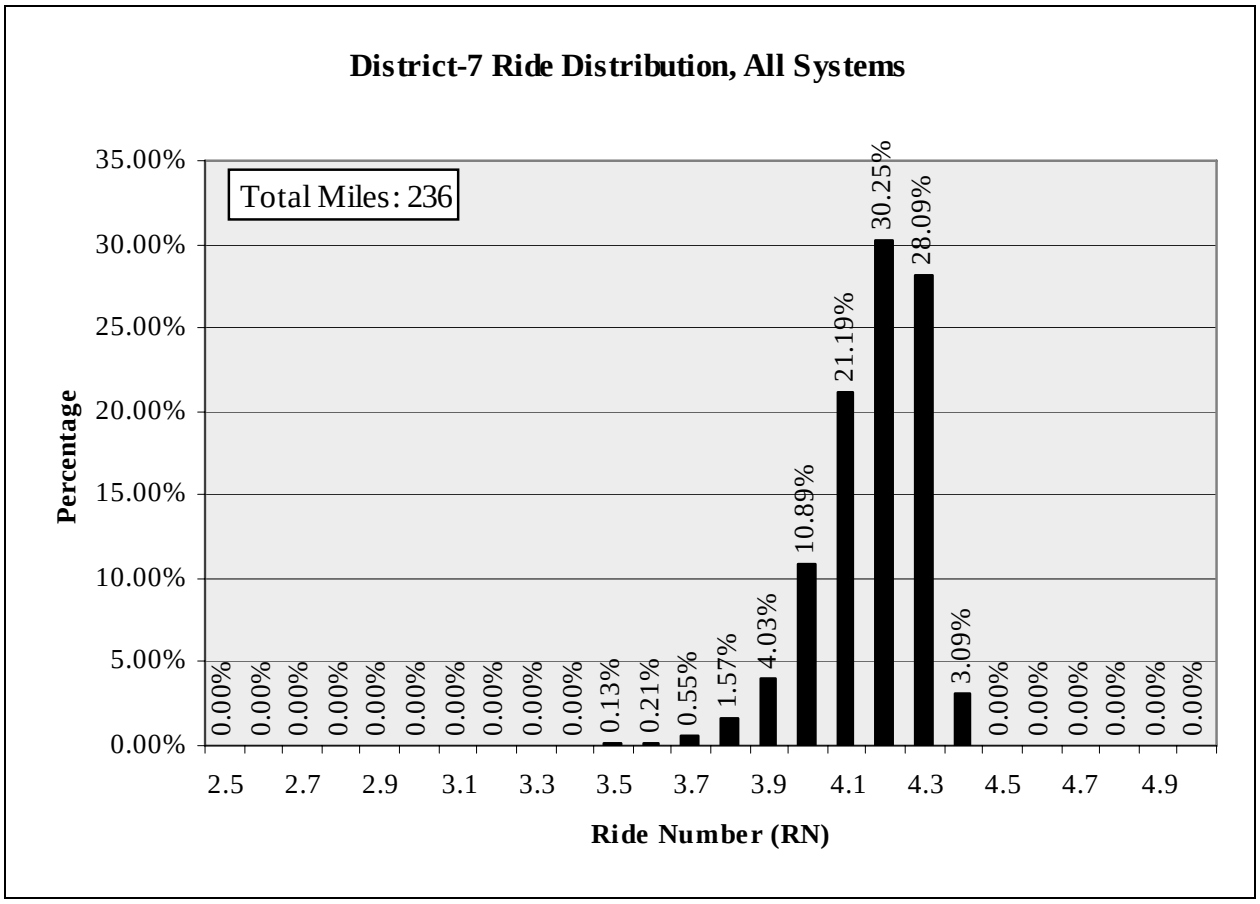

Figure 30 Ride Distribution, District 7, All Systems.

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
All Systems	236.0	2,360	3.5	4.2	4.4	0.14	0	0

7.2 Ride Distribution by System Type

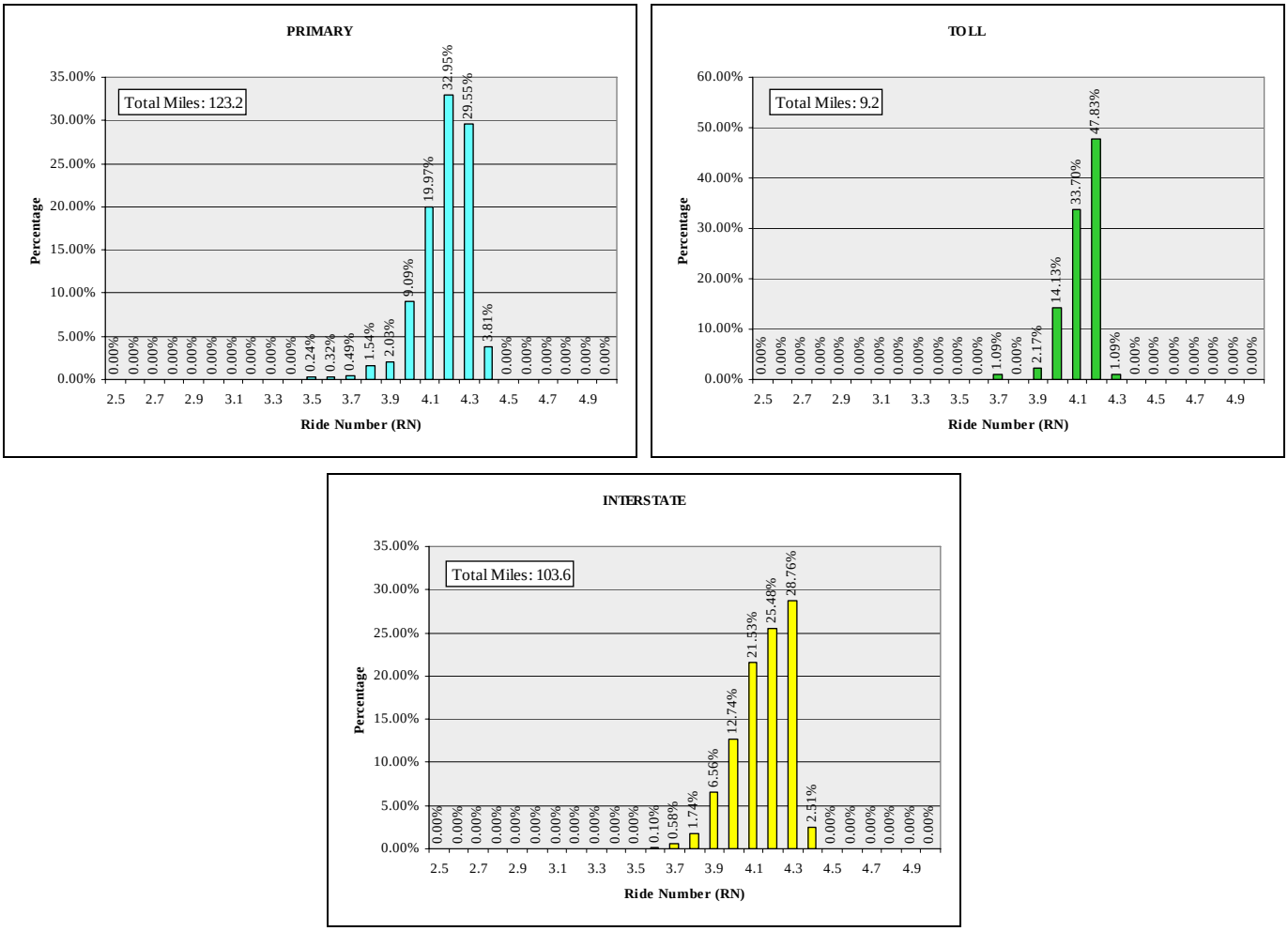

Figure 31 Ride Distribution, District 7, by System Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Primary	123.2	1,232	3.5	4.2	4.4	0.13	0	0
Toll	9.2	92	3.7	4.1	4.3	0.09	0	0
Interstate	103.6	1,036	3.6	4.2	4.4	0.14	0	0

7.3 Ride Distribution by Friction Course Type

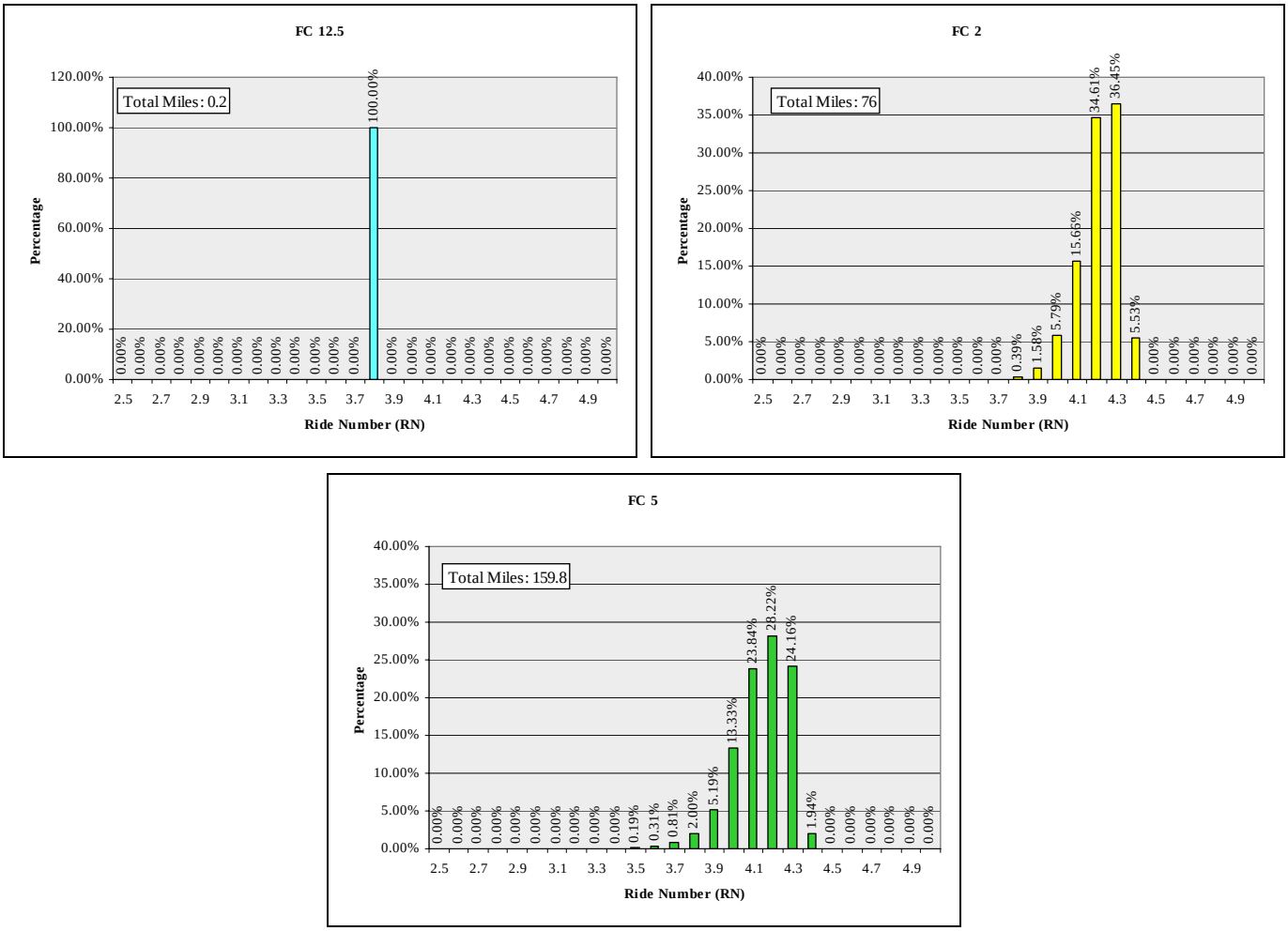

Figure 32 Ride Distribution, District 7, by System Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 12.5	0.2	2	3.8	3.8	3.8	0	0	0
FC 2	76	760	3.8	4.2	4.4	0.11	0	0
FC 5	159.8	1,598	3.5	4.2	4.4	0.14	0	0

7.4 District 7 Contractor Statistics

TABLE 11 District 7 Contractor Statistics

Contractor Code No.	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Couch	62.6	626	3.8	4.2	4.4	0.11
Macasphalt	33.2	332	3.5	4.1	4.3	0.15
A.P.A.C.	46.7	467	3.7	4.2	4.4	0.12
Ajax Paving	60.5	605	3.7	4.1	4.4	0.15
J.W.Conner & Sons	33.0	330	3.6	4.2	4.4	0.12

District

8

8.1 District 8 (Turnpike) Ride Distribution

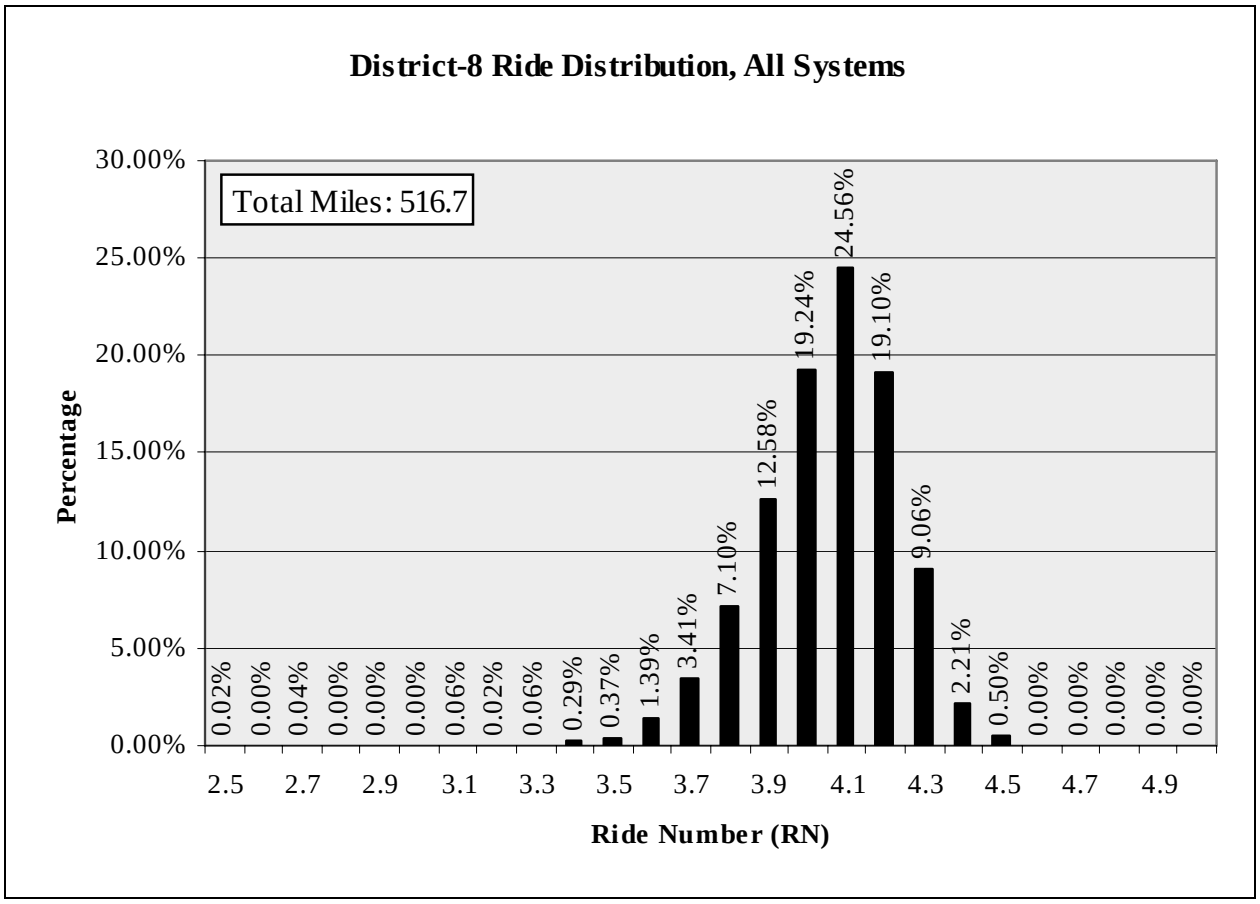

Figure 33 Ride Distribution, District 8 (Turnpike).

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
Turnpike	516.7	5,167	2.5	4.1	4.5	0.18	25	2.5

8.2 Ride Distribution by Friction Course Type

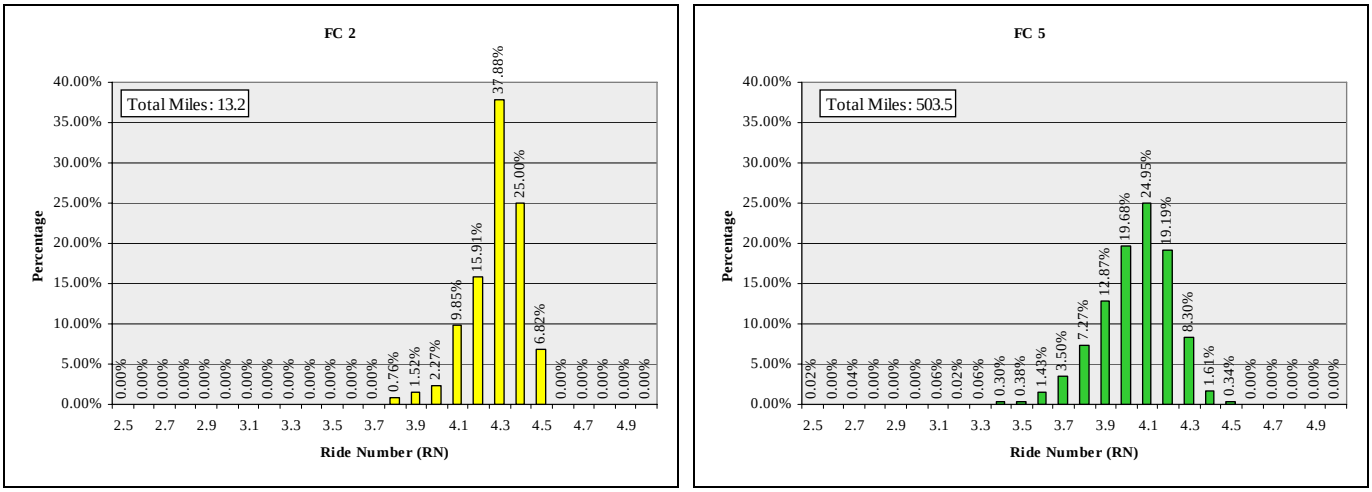

Figure 34 Ride Distribution, District 8, by Friction Course Type

Type	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev	RN < 3.5	
							Lots	Miles
FC 2	13.2	132	3.8	4.3	4.5	0.13	0	0
FC 5	503.5	5,035	2.5	4.1	4.5	0.18	25	2.5

Note: District 8 comprises of the Turnpike only. Therefore a separate graph of ride distribution by system type has not been shown.

8.3 District 8 Contractor Statistics

TABLE 12 District 8 Contractor Statistics

Contractor Code No.	Total No of Miles	Total No of Lots	Minimum	Mean	Maximum	St. Dev
Hubbard	10.6	106	3.9	4.2	4.4	0.1
Ranger	24.0	240	3.7	4.2	4.4	0.09
C.A.Meyers	13.2	132	3.8	4.3	4.5	0.13
D.A.B	55.7	557	2.5	4.2	4.4	0.2
A.P.A.C.	42.1	421	3.1	4	4.3	0.16
Orlando Paving	76.0	760	3.5	4.1	4.5	0.19
Community Asphalt	90.7	907	3.3	4.0	4.3	0.15
East Coast Paving	31.7	317	3.1	3.9	4.1	0.14
Hardrives of Delray	10.2	102	3.6	4.0	4.3	0.13
Dickerson Asphalt	25.0	250	3.5	4.0	4.2	0.12
Elmo Greer	77.8	778	3.5	4.1	4.4	0.14
Bergeron Land Development Inc.	59.7	597	3.4	3.9	4.3	0.13

APPENDIX

A

PROJECT SPECIFIC INFORMATION

DISTRICT

1

District 1 Project Information

District -1				
FIN NO	Number of Lots	Mean	Median	StDev
19395725201	191	4.4	4.4	0.06
19407125201	64	3.8	3.8	0.16
19415225201	24	4.3	4.3	0.08
19417225201	108	4.4	4.4	0.07
19443525201	260	4.1	4.1	0.11
19443625201	275	4.4	4.4	0.08
19447725201	4	4.1	4.1	0.25
19581325201	51	4.0	4.1	0.35
19590225201	44	4.0	4.1	0.21
19700725201	85	3.9	3.9	0.11
19727025201	78	4.0	4.0	0.11
19730825201	40	3.9	4.0	0.09
19766315201	231	4.2	4.3	0.13
19766925201	48	4.2	4.2	0.11
19789825201	23	3.8	3.9	0.27
20120415201	530	3.9	4.0	0.17
20120925201	935	4.1	4.2	0.12
40674715201	119	4.1	4.1	0.13
40676415201	189	4.0	4.0	0.15
40846115201	367	4.2	4.2	0.11
41186415201	92	3.9	3.9	0.14

DISTRICT

2

District 2 Project Information

District -2				
FIN NO	Number of Lots	Mean	Median	StDev
20761125201	74	4.2	4.2	0.21
20775625201	42	3.9	3.9	0.09
20777915201	280	4.4	4.5	0.17
20778535201	168	4.1	4.1	0.09
20779415201	708	4.2	4.2	0.11
20779625201	68	4.4	4.5	0.12
20779725201	134	4.2	4.2	0.10
20784315201	332	4.2	4.2	0.09
20784425201	190	4.4	4.4	0.10
20801315201	298	4.3	4.3	0.09
20801515201	247	4.2	4.2	0.08
20801715201	170	4.1	4.1	0.06
20817315201	240	4.1	4.2	0.22
20822215201	224	4.2	4.2	0.06
20822625201	319	4.3	4.3	0.12
20840645201	190	4.0	4.0	0.12
20978725201	147	4.2	4.3	0.16
21028825201	395	4.2	4.2	0.13
21042015201	619	4.3	4.3	0.08
21043115201	315	4.3	4.3	0.11
21070115201	176	4.3	4.3	0.10
21089615201	332	4.3	4.3	0.19
21089925201	229	4.4	4.4	0.08
21294945201	1970	4.1	4.1	0.10
21307415201	398	4.2	4.3	0.11
21307615201	216	4.3	4.3	0.07
21307715201	543	4.2	4.2	0.09
21308425201	480	4.2	4.2	0.09
21325925201	243	4.1	4.1	0.08
21326225201	208	4.1	4.2	0.21

District -2				
FIN NO	Number of Lots	Mean	Median	StDev
21327115201	351	4.1	4.2	0.11
21330015201	335	4.3	4.3	0.07
21330115201	298	4.2	4.2	0.08
21334015201	230	4.3	4.3	0.06
21334625201	122	4.2	4.2	0.07
21339515201	580	4.3	4.3	0.08
21339615201	522	4.2	4.3	0.10
21339715201	570	4.3	4.3	0.07
21343415201	150	4.3	4.3	0.06
21343615201	268	4.3	4.3	0.11
21343715201	224	4.3	4.3	0.12
21343815201	237	4.4	4.4	0.11
21343915201	206	4.3	4.3	0.07
21346915201	798	4.0	4.1	0.14
21355215201	348	4.2	4.2	0.09
21355415201	190	4.2	4.3	0.23
21356015201	236	4.1	4.2	0.52

DISTRICT

3

District 3 Project Information

District -3				
FIN NO	Number of Lots	Mean	Median	StDev
21937815201	98	4.0	4.1	0.22
21944815201	237	3.9	4.0	0.21
22247215201	370	4.2	4.2	0.10
22247315201	126	4.3	4.3	0.08
22253315201	338	4.2	4.2	0.10
22256715201	283	4.2	4.3	0.07
22256915201	165	4.2	4.2	0.08
22259515201	152	4.1	4.1	0.07
22263515201	146	4.3	4.3	0.07
22263615201	148	4.3	4.3	0.07
22263715201	157	4.3	4.3	0.08
22272015201	124	4.3	4.3	0.11
22272115201	304	4.3	4.3	0.06
22272215201	208	4.1	4.1	0.10
22276815201	428	4.3	4.3	0.08
22276915201	346	4.1	4.2	0.09
22280015201	256	4.2	4.3	0.06
22283115201	176	4.3	4.3	0.05
40392315201	187	4.1	4.1	0.08
40392915201	286	3.9	3.9	0.27
40395215201	132	4.1	4.1	0.10
40593515201	260	4.3	4.3	0.07
40632415201	62	4.2	4.2	0.12
40887615201	224	4.0	4.0	0.12
40901515201	54	4.4	4.5	0.07

DISTRICT

4

District 4 Project Information

District -4				
FIN NO	Number of Lots	Mean	Median	StDev
23178415201	361	4.2	4.2	0.12
40613015201	93	3.9	3.9	0.19

DISTRICT

5

District 5 Project Information

District -5				
FIN NO	Number of Lots	Mean	Median	StDev
23760215201	349	4.3	4.3	0.11
23763315201	124	4.1	4.2	0.17
23792515201	90	4.0	4.1	0.30
23792615201	82	4.2	4.2	0.08
23875615201	78	4.2	4.2	0.12
23876015201	46	4.4	4.5	0.17
23967425201	21	4.0	4.0	0.10
23973815201	248	4.3	4.3	0.12
23974015201	84	4.2	4.3	0.12
24022915201	46	4.3	4.3	0.14
24102515201	55	4.1	4.1	0.18
24102615201	266	4.2	4.3	0.22
24231615201	595	4.1	4.2	0.11
24263315201	583	4.4	4.4	0.09
24269615201	515	4.2	4.2	0.10
24270215201	339	4.2	4.2	0.09
24271535201	150	4.0	4.0	0.13
40393515201	86	3.9	3.9	0.14
40393615201	418	4.0	4.0	0.15
40393715201	144	4.0	4.0	0.10
40916515201	92	4.0	4.0	0.14
40916615201	208	4.0	4.0	0.14
40918015201	236	4.2	4.2	0.13
40984715201	420	4.1	4.1	0.13
41166415201	352	4.0	4.0	0.14
41177815201	50	4.0	4.1	0.11
41178315201	32	4.0	4.0	0.17
41180915201	777	4.2	4.2	0.09
41199315201	316	4.1	4.1	0.10
41235715201	6	4.3	4.4	0.17
41353515201	100	4.2	4.2	0.12
41357515201	122	4.0	4.0	0.11

DISTRICT

6

District 6 Project Information

District -6				
FIN NO	Number of Lots	Mean	Median	StDev
25124015201	57	4.1	4.1	0.19
41275715201	18	4.0	4.0	0.05

DISTRICT

7

District 7 Project Information

District -7				
FIN NO	Number of Lots	Mean	Median	StDev
25483415201	488	4.2	4.2	0.11
25569715201	272	4.3	4.3	0.10
25576815201	92	4.1	4.1	0.09
25692815201	138	4.2	4.3	0.10
25710115201	139	4.1	4.1	0.15
25710125201	167	4.1	4.2	0.11
25710135201	26	4.0	4.0	0.20
25866715201	330	4.2	4.2	0.12
40374115201	333	4.0	4.1	0.12
40374215201	373	4.2	4.2	0.11
40376515201	2	3.8	3.8	0.00

DISTRICT

8

District 8 Project Information

District -8				
FIN NO	Number of Lots	Mean	Median	StDev
23220515201	416	4.1	4.1	0.08
23235215201	597	3.9	3.9	0.13
23251315201	317	3.9	3.9	0.14
23259415201	240	4.2	4.3	0.09
23261015201	106	4.2	4.2	0.10
24285915201	309	4.1	4.2	0.24
24298615201	108	4.3	4.3	0.13
24309315201	24	4.2	4.2	0.11
25192915201	409	3.9	4.0	0.18
40667815201	536	4.2	4.1	0.13
40794515201	421	4.0	4.0	0.16
40794815201	224	3.9	3.9	0.15
40914215201	100	4.0	4.1	0.14
40914315201	150	4.0	4.1	0.11
40914515201	102	4.0	4.0	0.13
41153215201	778	4.1	4.1	0.14
41362315201	248	4.2	4.2	0.11
41367115201	82	4.0	4.0	0.10

APPENDIX

B

OTHER STATISTICS

TABLE B1 Ride Distribution by Travel Lane

Travel Lane	Number of Lots	Mean	Median	St. Deviation
EBML	301	4.1	4.1	0.18
EBPL	2,643	4.2	4.2	0.17
EBTL	3,746	4.2	4.2	0.18
WBML	297	4.1	4.1	0.17
WBPL	2,591	4.2	4.2	0.21
WBTL	3,715	4.2	4.2	0.17
NBML	1,679	4.1	4.2	0.14
NBPL	5,255	4.1	4.1	0.15
NBTL	6,445	4.2	4.1	0.19
SBML	1,788	4.1	4.2	0.17
SBPL	5,002	4.1	4.1	0.16
SBTL	6,269	4.2	4.2	0.18

TABLE B2 Ride Distribution by Project Type

Type Project	Number of Lots	Mean	Median	St. Deviation
Ride Acceptance	22,485	4.16	4.2	0.17
Ride Evaluation	17,246	4.16	4.2	0.19

TABLE B3 Ride Distribution by Unit of Measurement

Type Project	Number of Lots	Mean	Median	St. Deviation
English (E)	26,488	4.13	4.2	0.17
Metric (M)	13,243	4.21	4.2	0.17

Customer Service Form

In an effort to continuously improve our customer service, the Pavement Material Systems Section of the State Materials Office requests your input by filling out and returning this survey form.

(*Optional)*
Your name: _____ Title: _____
Company/Office/Organization: _____
Address: _____ City/State/Zip: _____
Phone: _____SunCom: _____ e-mail: _____

Please rate each of the following factors using the scale provided. A "1" corresponds to ***Very Poor****, and a "5" corresponds to* ***Excellent****.*

Usefulness of Content	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Organization of Information	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Clarity of Graphical Illustrations	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Format of Tables	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Overall Value of this Report	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Please provide an answer to the following questions. Use an additional sheet(s) if needed.

What was the most useful/informative part of this report? _____

What was the least useful/informative part of this report? _____

What changes would you recommend to improve this report? _____

Detach and Mail to:

State Materials Office
Attn: Abdenour (Nour) Nazef, P.E.
5007 NE 39th Ave.
Gainesville, FL 32609

Abdenour.nazef@dot.state.fl.us