STATE OF FLORIDA

2004 RESILIENT MODULUS OF ROADBED SOILS

FACTS & FIGURES

Research Report
FL/DOT/SMO/05-481

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STATE MATERIALS OFFICE

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PAVEMENT MATERIALS SYSTEMS SECTION

The mission of the Pavement Material Systems Section is to monitor and report on the condition, structural adequacy, and performance of Florida's roadway system and to provide technical expertise for safe and long-lasting pavement systems.

Our vision is to be acknowledged by our customers and partners as achievers of excellence in the evaluation and performance-prediction of pavement systems.

To learn more about our people, functions, and services, we invite you to visit us at:

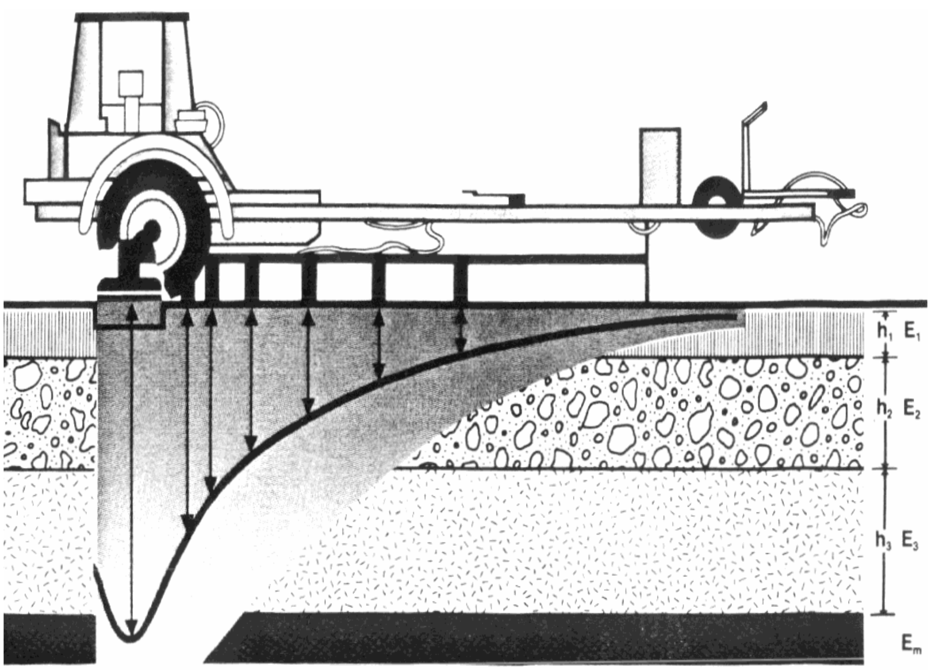
http://www.dot.state.fl.us/statematerialsoffice/pavement/pavementhome.htm

EXECUTIVE SUMMARY

One of the primary functions of the Non-Destructive Testing Group, a unit of the State Materials Office in Gainesville, Florida, is to characterize the in-situ properties of Florida's roadbed materials for pavement design purposes. The basis for such a characterization is the resilient modulus (M_R). The resilient modulus is a measure of the material elastic property recognizing its certain nonlinear characteristics. It is estimated, in our case, in-place from deflection measurements. This information has been critical to the Department's effort to support informed highway planning, as well as policy and decision making. This requires the apportionment and allocation of funds as well as the determination of appropriate cost-effective strategies to rehabilitate and preserve existing highway transportation infrastructure.

This report is intended to provide information regarding our program testing procedures, to report current and past M_R values on a statewide basis, and to identify historical regional M_R trends in the various Districts.

PART I: OVERVIEW



INTRODUCTION

One of the primary functions of the Non-Destructive Testing (NDT) program is to characterize the in-situ properties of the Florida's roadbed (embankment) materials for pavement design purposes. The basis for such a characterization is the resilient modulus (M_R). The resilient modulus is a measure of a material's elastic property recognizing its nonlinear characteristics. It is directly estimated, in our case, in-place using deflection-based techniques.

Deflection-Based Techniques

Due to their speed and ease of operation deflection-based techniques are being widely used in the evaluation of the structural integrity and for estimating the elastic moduli of in-place pavement systems. The deflections can be non-destructively induced and measured using various commercially available devices. These devices are designed based on a variety of loading modes and measuring sensors. The loading modes include static, steady-state vibratory, and impulse loading; while the resulting responses are measured with sensors that include geophones, accelerometers, and linear voltage differential transducers (LVDT).

USE OF DEFLECTION-BASED DEVICES: FLORIDA HISTORICAL PERSPECTIVE

The Department implemented the use of the Falling Weight Deflectometer (FWD) in the early 1980s. It has, however for pavement design purposes, initially specified the use of a Benkelman Beam, and then the use of a vibratory-type device (Dynaflect).

Benkelman Beam

The Benkelman Beam was the first deflection-based device used in Florida for pavement design purposes. It was developed by A.C. Benkelman during the Western Association of State Highway Officials (WASHO) Road Test. It consists of a measurement probe hinged to a three-legged reference beam, as schematically illustrated in Figure 1. The probe is positioned between the rear dual tires of a track, and the rebound deflection is measured by a dial placed on the reference beam when the truck is slowly driven away. Although this method is simple and relatively inexpensive, it is also slow and labor intensive. In addition, the measurements are usually limited to maximum deflections only and are produced under unrealistic load durations. Furthermore, the leveled position of the reference beam may, in some cases, be unduly influenced by the deflection basin.

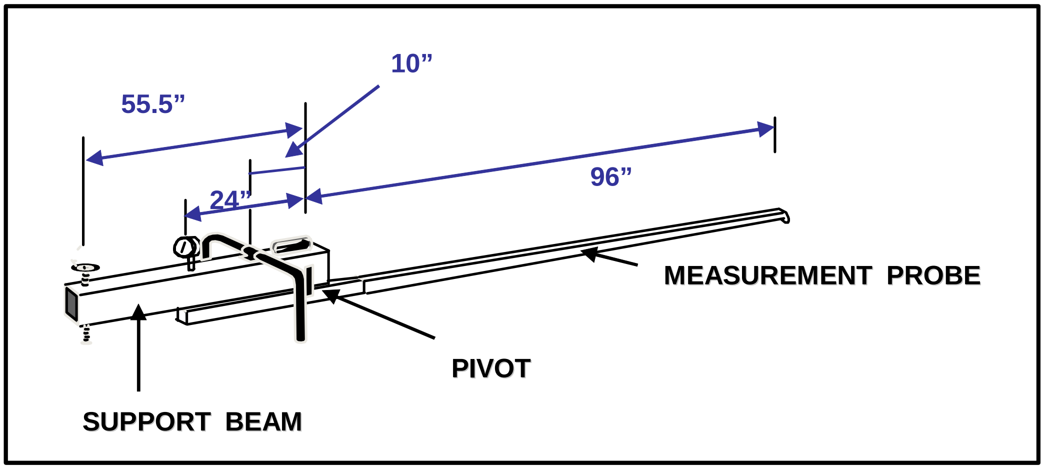


Figure 1. Schematic Illustration of a Benkelman Beam

Dynaflect

In mid-1980s, the Department switched to a steady-state vibratory device, known as Dynaflect. The Dynaflect consists of a relatively lightweight (2,000 lbs.) two-wheel trailer equipped with an automated data acquisition and control system. The deflections are generated by a combination of a sinusoidal dynamic load and the static weight of the trailer. The dynamic loading of a pavement surface is done using two counter-rotating eccentric steel weights. These steel weights, rotating at a constant frequency of eight cycles per second (8 Hz), generate a peak-to-peak dynamic load of approximately 1000 pounds in magnitude. The resulting deflections of a pavement system are measured with geophones. The geophones are electromechanical devices that use a magnetic field to produce an electrical impulse. These geophones are suspended, at set intervals, from the tongue of the trailer.

A primary advantage of the Dynaflect over a static-loading device, such as Benkelman beam, is that a reference frame is not required. In addition, the Dynaflect generates a complete deflection basin at each test location. However, the fixed magnitude and the loading frequency are its major limitations. A photographic illustration of a Dynaflect is given in Figure 2.

Figure 2. Dynaflect Device

Falling Weight Deflectometer

The Falling Weight Deflectometer (FWD) consists of a trailer mounted, falling weight system capable of loading a pavement in a manner that simulates actual wheel loads in both magnitude and duration. An impulse load is generated by dropping a mass from a specified height. The mass is raised hydraulically, then released by an electrical signal and dropped with a buffer system on a 12-inch diameter rigid steel plate. A set of springs between the falling mass and hit bracket mounted above the load cell buffers the impact by decelerating the mass. A thin, neoprene pad rests between the plate and the pavement surface to allow for an even load distribution. When a weight is dropped, an impulse load enters the pavement system creating body and surface waves. The resulting vertical velocity of the pavement surface is picked up through a series of sensors located along the centerline of the trailer. These signals are then used to obtain the maximum deflection from each geophone through analog integrations. A single analog integration of a signal generates the deflection-time trace. The deflection measurements are recorded by the data acquisition system typically located in the tow vehicle. Figure 3 provides a schematic illustration of the FWD loading principle.

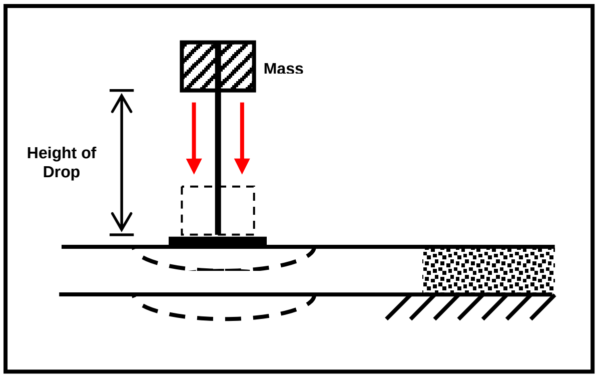


Figure 3. FWD Loading Principle

The use of the Falling Weight Deflectometer (FWD) testing for pavement design and rehabilitation purposes was first introduced by AASHTO in the 1993 Pavement Design Guide. In recent years, the FWD has gained further acceptance among highway agencies because of its versatility, reliability, and ease of use. The FWD loading is believed to better simulate the effects of traffic on pavement structures. Therefore as of March 2001, the Department has implemented the use of FWD for all pavement-related evaluations, including design activities. A photographic illustration of the FWD is shown in Figure 4.

Figure 4. Falling Weight Deflectometer

CURRENT FWD STATE-OF-THE-PRACTICE

In May of 2001, the Department conducted a survey to assess the current practices of using FWD by highway agencies *(1)*. Following are general findings on the current state practices in two FWD program areas, based on a 71 percent response rate:

FWD Program Management

- 70 percent of the respondents own and operate Dynatest units, while 11 percent own and operate JILS units, 8 percent own and operate KUAB units, and the remaining 8 percent own and operate a combination of Dynatest, KUAB, and/or JILS units.
- The average use of the FWD with respect to program areas is 63 percent for structural capacity evaluation, 18 percent for research, 15 percent for pavement investigation, and 4 percent for other pavement evaluation activities.
- 78 percent of the respondents use FWD at the project level, while 19 percent use it at both project and network levels.
- 61 percent of the respondents test less than 500 roadway lane miles annually.
- The average annual FWD operating budget varies among agencies depending on the number of projects, project length, and individual costs involved.
- In addition to testing State highways, 39 percent of the respondents use FWD to test city streets, 11 percent test airport runways, and 17 percent test some other type of facilities.

FWD Operation

- 72 percent of responding agencies have a Quality Control/Quality Assurance plan in effect.
- 57 percent typically use one crewmember per FWD unit.
- 72 percent perform an annual reference calibration on their FWD unit(s).
- Over 69 percent perform a monthly relative calibration on their FWD unit(s).
- Over 31 percent use in-service pavements to perform a relative calibration.
- 64 percent use a seven-sensor set up when testing for a typical pavement rehabilitation project.
- Nearly 70 percent of the FWD units owned by these agencies operate under the DOS environment.
- Only 28 percent of the transportation agencies use a seasonal and/or temperature adjustment factor(s) for determining the effective subgrade modulus for design purposes.

FLORIDA TESTING PROCEDURE

Deflection Testing

When testing with the FWD for pavement design purposes, two 9-kip load drops are used. However, only the deflection data resulting from the last loadings are considered for roadbed soil characterization. It is generally believed that the deflection data produced under the first impact load may not always be representative of the true pavement response *(2)*. Therefore, the first load is mainly used for the loading plate "seating" purposes. All the deflection data are obtained using the sensor configuration shown in Figure 5.

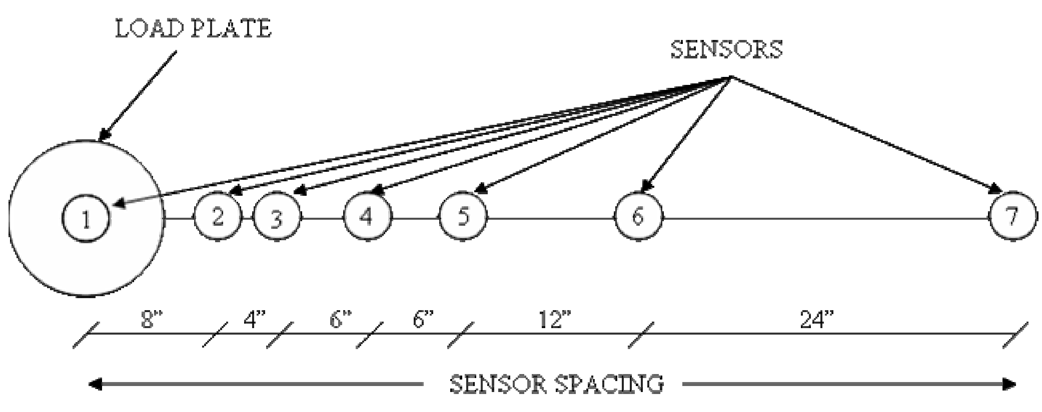


Figure 5. Schematic Illustration of Sensor Configuration

Prediction of In-Place Moduli of Embankment Material

The current procedure for predicting the insitu strength of the embankment material of a pavement system is based on the procedure described in the *AASHTO Guide for Design of Pavements Structures* calibrated to Florida conditions *(3)*. This method was originally proposed by Ullidtz *(4)*, and is based on Boussinesq's theory on a concentrated load applied on an elastic half-space *(5)*. In this procedure, the modulus of an embankment material is estimated as follows:

$$E_r = 0.24P / d_r \cdot r \qquad (2)$$

Where:

E_r = Subgrade modulus, in psi;
P = Applied load, in pounds;
d_r = Deflection measured at a radial distance r, in inches; and
r = Radial distance at which the deflection is measured, in inches.

The *AASHTO Design Guide* suggests the deflection used in the above equation be measured as close as possible to the loading plate and yet be sufficiently far from the load. This is suggested to satisfy the assumption that, at points sufficiently distant from the load, the deflections measured at the pavement surface are mainly due to the embankment deformation, and are also independent of the load plate size. Florida's previous experience with non-destructive deflection testing has shown that the pavement deflections measured at 36 inches away from the load are appropriate for the determination of the embankment moduli. Therefore, only the pavement deflections measured at 36 inches (r = 36 inches in equation 2) away from the load are considered for design purposes in the Florida procedure. Furthermore, within a project limits, the resilient modulus (Mr) value is reported based on the mean deflection plus two standard deviations (d_r = mean deflection + 2 σ).

PROJECT TESTING REQUESTS

To request a project to be tested, simply contact:

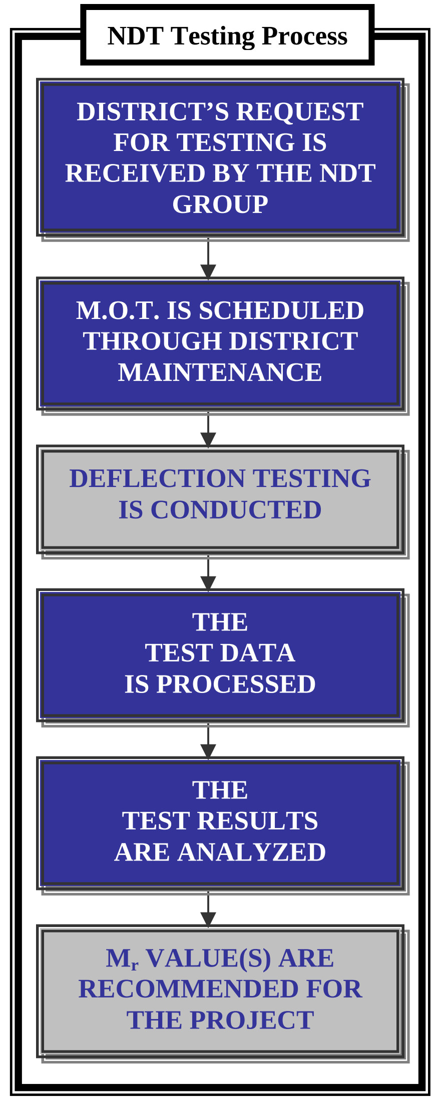
Charles Holzschuher
Nondestructive Testing
charles.holzschuher@dot.state.fl.us
Fax: (352) 955-6345

NOTE: *Please Carbon Copy your District Maintenance Engineer for Maintenance of Traffic.*

Include the following information within the body of the request:

1.) Roadway Id
(e.g. SR 91, 91470000, FL Turnpike)
2.) County Name
(e.g. Okeechobee)
3.) Project Limits
(e.g. MP 181.7 to MP 188.9)
4.) Exceptional Needs
(e.g. Extend testing 1000 ft past Begin/End segment limits.)
5.) Project Location Map
6.) Recommended Due Date
7.) MOT, Traffic Restrictions

After the request has been received by the NDT group, the District Maintenance Office will schedule the maintenance of traffic at the request of the SMO and deflection testing will be conducted. The flow chart to the right details the project testing process.



For coordination purposes, it is best to provide the State Materials Office with as much time as possible by submitting any testing requests immediately after the work program has been updated and the project schedules are set. In order to ensure that all requests may be dealt with in a timely and efficient manner, a minimum of 6 months is required by the State Materials Office for testing. Furthermore, an annual district-wide listing of test projects is preferred to properly schedule crew travel times and equipment.

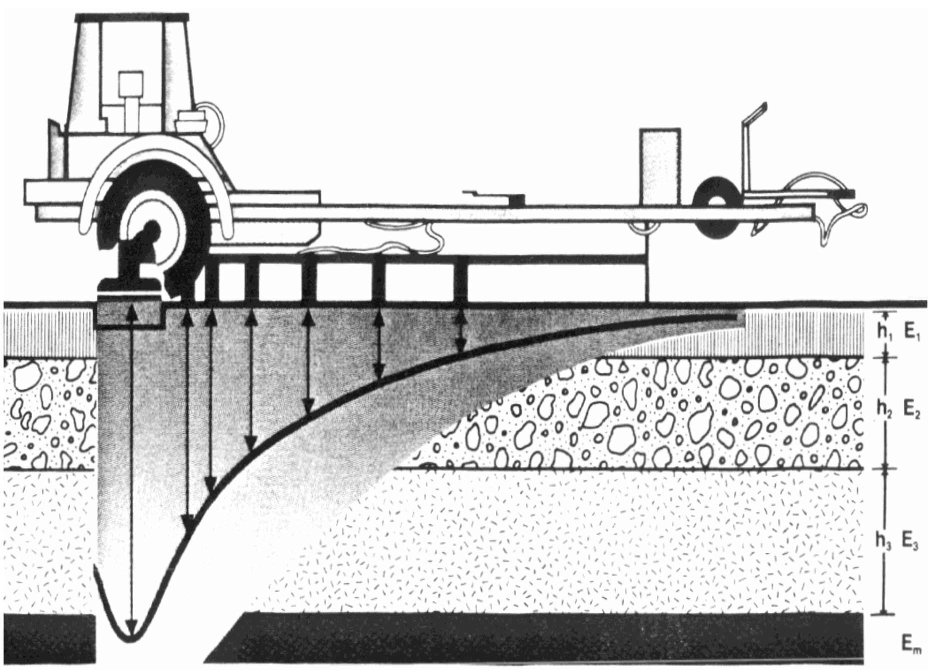
Field Testing Requirements

Generally testing is only conducted on 2-lane projects greater than 1 mile long, or on multi-lane projects greater than 0.5 mile long.

Testing frequency for 2-lane projects is conducted at 28 tests / mile in one direction. For multi-lane projects testing is conducted at 14 tests / mile / each direction.

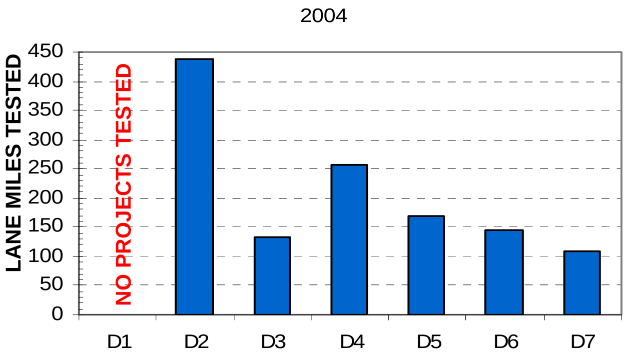
PART II:

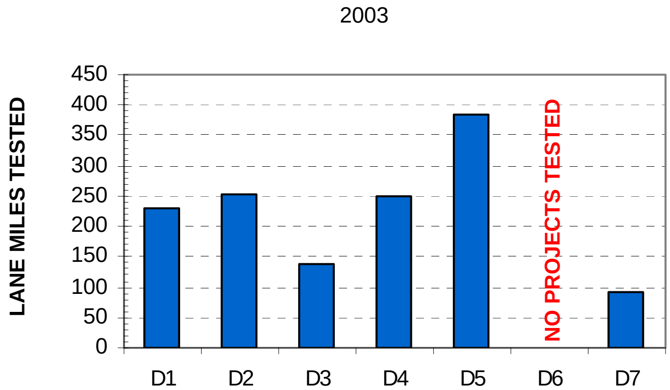
FACTS & FIGURES[1]

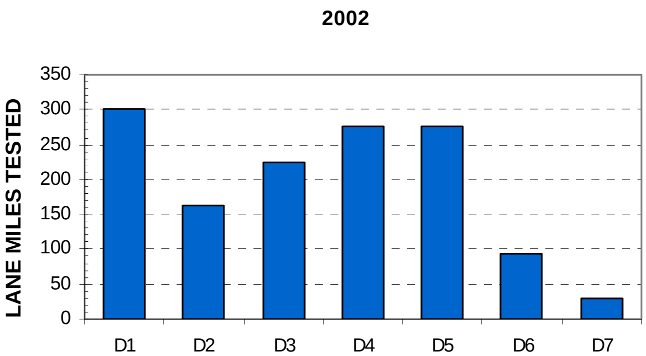


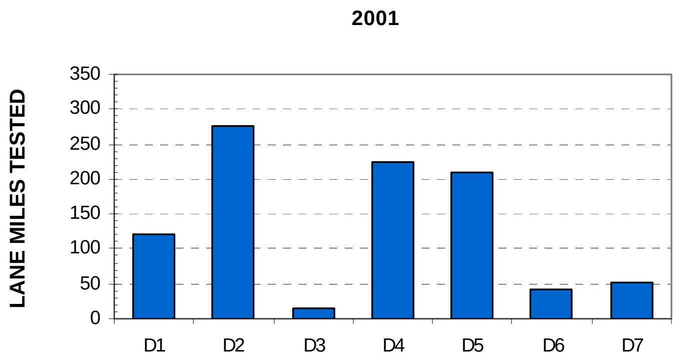
[1] Project resilient modulus values presented are the lowest values recommended for each project. Some projects may have multiple resilient modulus values.

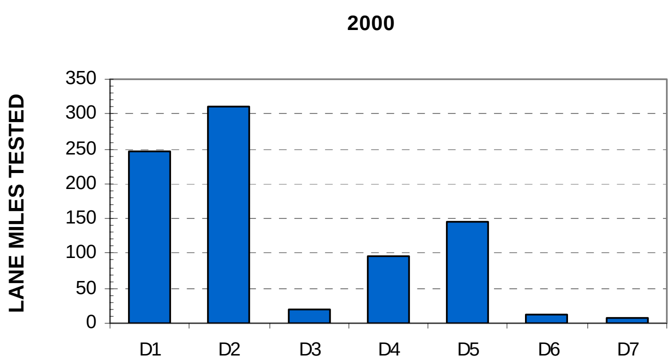
ANNUAL LANE MILES TESTED BY DISTRICT



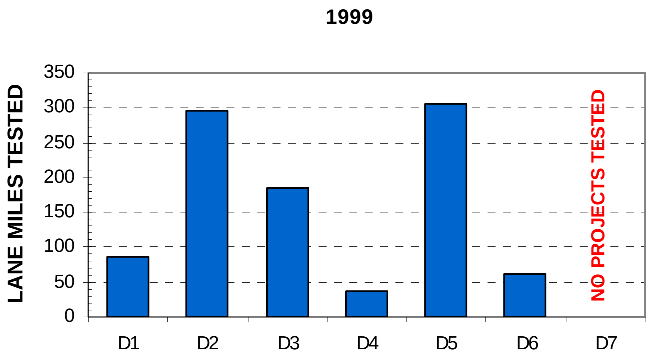


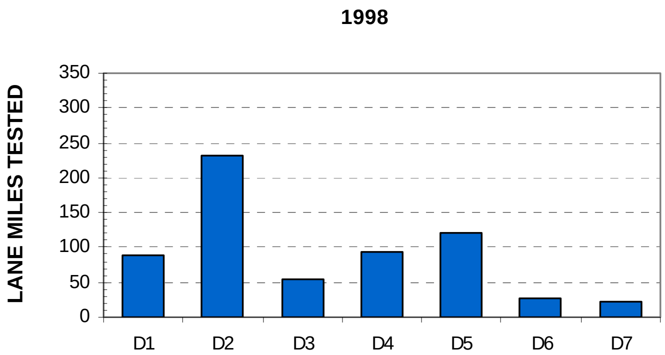


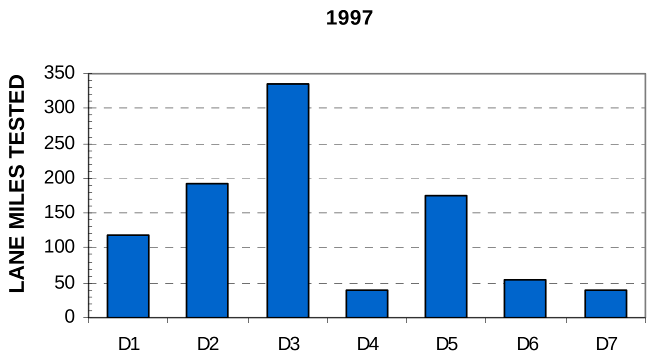


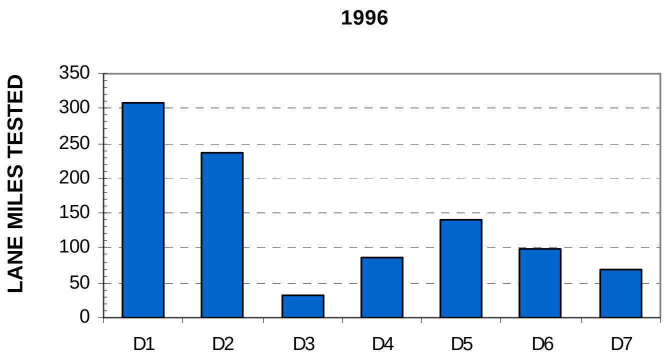


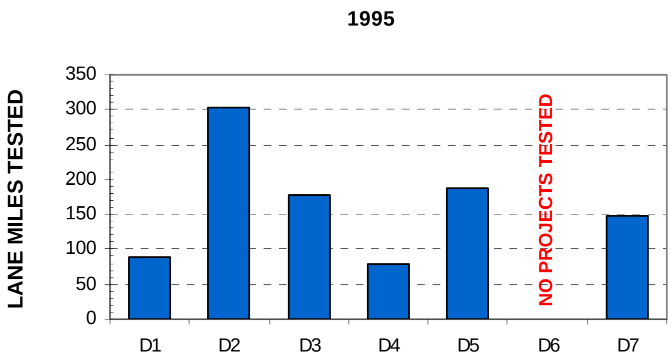
ANNUAL LANE MILES TESTED BY DISTRICT





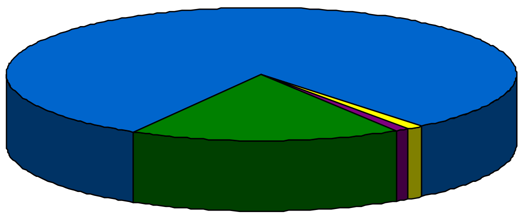






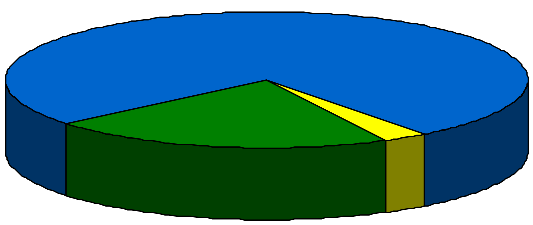
TOTAL LANE MILES TESTED FROM 1995 TO 2004

District 1



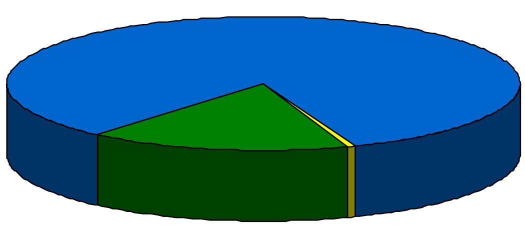
System	Lane Miles Tested	Percent Lane Miles Tested
Primary	1476.492	80.9%
Secondary	19.249	1.1%
Turnpike/Toll	14.000	0.8%
Interstate	314.826	17.3%
All Systems	1824.567	100.0%

District 2



System	Lane Miles Tested	Percent Lane Miles Tested
Primary	2490.609	75.8%
Secondary	90.463	2.8%
Tunrpike/Toll	0.000	0.0%
Interstate	703.724	21.4%
All Systems	3284.796	100.0%

District 3

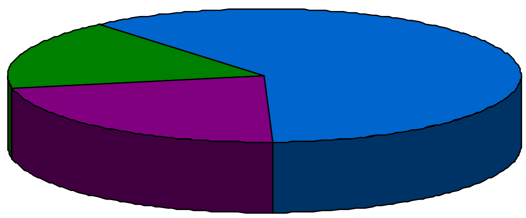


System	Lane Miles Tested	Percent Lane Miles Tested
Primary	1497.845	83.2%
Secondary	8.017	0.4%
Turnpike/Toll	0.000	0.0%
Interstate	294.656	16.4%
All Systems	1800.518	100.0%

Primary Secondary Turnpike/Toll Interstate

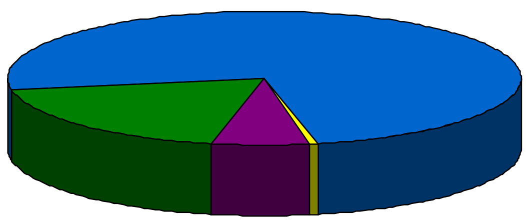
TOTAL LANE MILES TESTED FROM 1995 TO 2004

District 4



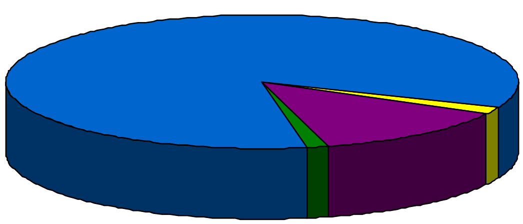
System	Lane Miles Tested	Percent Lane Miles Tested
Primary	1079.168	60.5%
Secondary	0.997	0.1%
Turnpike/Toll	401.677	22.5%
Interstate	302.349	16.9%
All Systems	1784.191	100.0%

District 5



System	Lane Miles Tested	Percent Lane Miles Tested
Primary	1946.658	74.6%
Secondary	8.029	0.3%
Turnpike/Toll	165.041	6.3%
Interstate	490.442	18.8%
All Systems	2610.170	100.0%

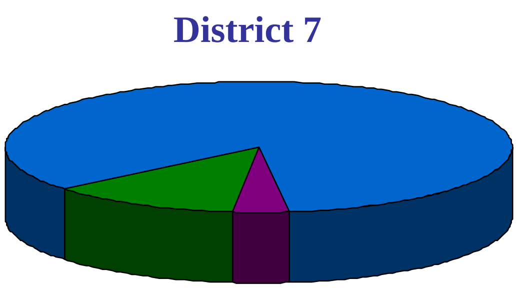
District 6



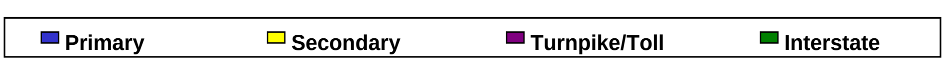
System	Lane Miles Tested	Percent Lane Miles Tested
Primary	562.478	84.2%
Secondary	11.065	1.7%
Turnpike/Toll	85.652	12.8%
Interstate	8.806	1.3%
All Systems	668.001	100.0%

Primary Secondary Turnpike/Toll Interstate

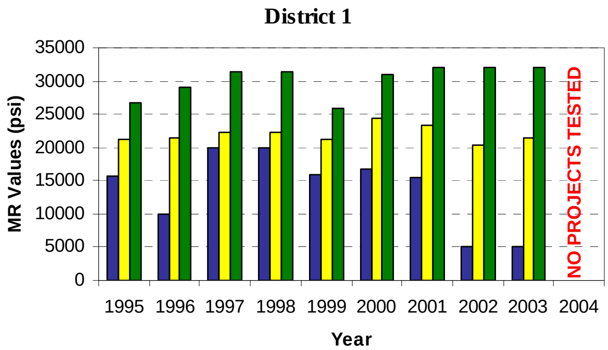
TOTAL LANE MILES TESTED FROM 1995 TO 2004

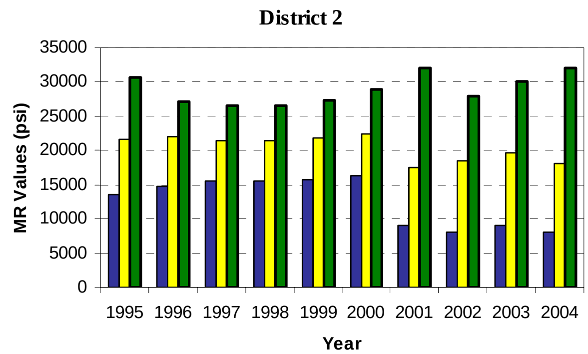


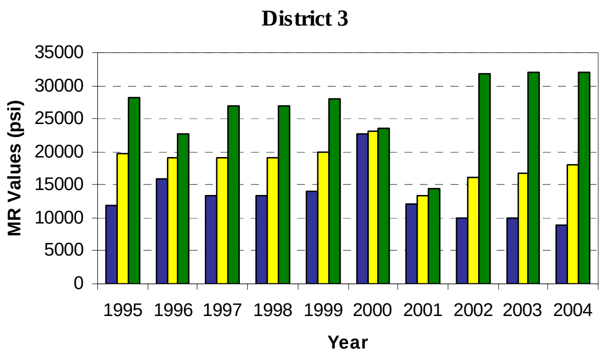
System	Lane Miles Tested	Percent Lane Miles Tested
Primary	698.515	84.2%
Secondary	0.800	0.1%
Turnpike/Toll	28.607	3.4%
Interstate	101.884	12.3%
All Systems	829.806	100.0%

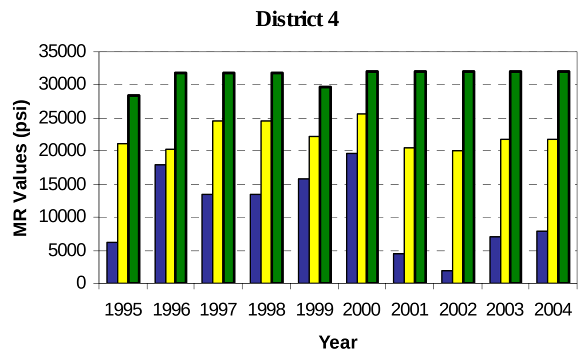


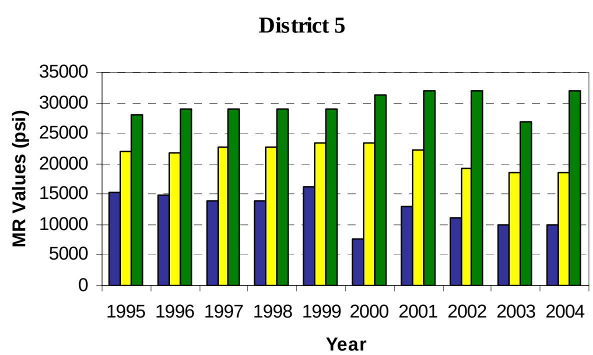
OVERALL RESILIENT MODULUS TRENDS BY DISTRICT
(All Systems)



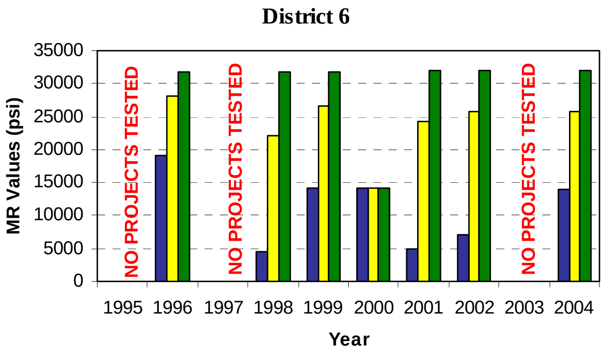


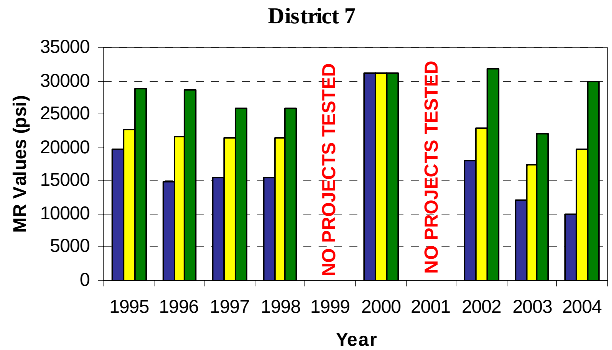


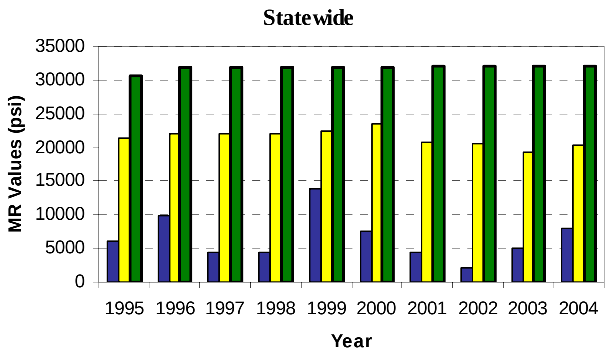


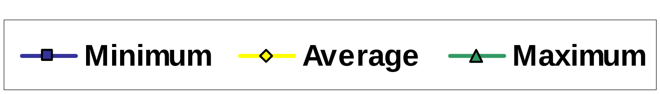


OVERALL RESILIENT MODULUS TRENDS BY DISTRICT
(All Systems)









2004 PROJECT LISTING BY DISTRICT

District 2

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
26005	207545-2	222	0.552	3.466	02/25/04	ETWT	Alachua	19,000
26010	207849-8	25	0.000	11.599	08/05/04	NTST	Alachua	13,000
26050	207614-2	24	3.299	4.258	02/25/04	NTST	Alachua	19,000
26050	207614-2	24	6.055	7.662	2/25/04	NTST	Alachua	16,000
26070	207594-2	26	12.317	14.048	02/25/04	ET	Alachua	25,000
26070	207850-3	26	0.000	1.877	06/28/04	ETWT	Alachua	16,000
27030	207911-3	121	10.793	16.404	06/10/04	NT	Baker	18,000
27090	213001-2	8	18.186	25.462	06/16/04	ETWT	Baker	20,000
27090	213003-2	8	0.000	8.884	06/16/04	ETWT	Baker	17,000
27090	213003-3	8	8.884	20.153	06/16/04	ETWT	Baker	27,000
28030	208002-2	16	0.000	3.701	04/01/04	ET	Bradford	25,000
28040	207973-2	18	0.000	5.708	04/01/04	WT	Bradford	15,000
28060	207978-3	235	0.000	0.657	04/01/04	ST	Bradford	32,000
29002	208366-2	10A	3.232	3.438	02/04/04	ETWT	Columbia	17,000
29010	208366-2	10	14.706	20.902	02/04/04	WT	Columbia	8,000
29070	208402-3	47	8.284	15.772	04/01/04	NT	Columbia	13,000
29090	208411-5	15	0.000	10.228	04/01/04	NT	Columbia	17,000
29170	213073-2	8	10.058	20.690	06/14/04	ETWT	Columbia	19,000
29180	213071-5	93	14.989	19.450	02/04/04	NTST	Columbia	24,000
30030	208447-2	349	23.492	39.021	06/23/04	NT	Dixie	13,000
30050	208466-2	51	0.000	1.518	06/23/04	NT	Dixie	15,000
31010	209737-2	26	7.789	10.325	05/25/04	WT	Gilchrist	10,000
31030	209769-2	49	12.804	23.488	05/25/04	NT	Gilchrist	15,000
33030	210059-2	349	0.000	8.724	04/14/04	NT	Lafayette	12,000
34010	210374-2	500	22.261	23.114	03/16/04	NTST	Levy	22,000
34040	210432-3	45	12.335	19.642	07/21/04	ST	Levy	16,000
34050	210376-2	55	0.000	9.831	03/16/04	NTST	Levy	19,000
34050	210376-3	55	24.026	36.547	08/19/04	NTST	Levy	20,000
34050	210376-4	55	9.854	24.026	08/19/04	NTST	Levy	16,000
34070	210384-3	24	2.237	9.227	07/21/04	ST	Levy	13,000
37040	210806-3	249	0.000	12.851	06/08/04	NT	Suwannee	15,000
37080	210719-2	247	0.000	10.700	06/09/04	NT	Suwannee	15,000
37120	213560-2	8	0.000	5.861	06/07/04	ETWT	Suwannee	29,000
38020	210878-2	20	0.000	1.784	07/01/04	ETWT	Taylor	25,000
38070	210850-2	51	2.127	11.853	07/01/04	ST	Taylor	16,000
39040	210949-2	16	0.000	2.652	06/08/04	NT	Union	15,000
39090	210952-2	231	0.000	2.739	06/08/04	ST	Union	32,000
71020	208085-2	15	0.000	1.239	03/18/04	NTST	Clay	18,000
71020	208085-3	15	1.239	6.539	03/18/04	NTST	Clay	12,000
71050	208203-2	16	0.000	2.156	03/18/04	ET	Clay	19,000

2004 PROJECT LISTING BY DISTRICT
District 2

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
72001	213345-1	9A	9.900	14.200	03/24/04	NTST	Duval	25,000
72040	209647-3	115	0.000	1.829	07/19/04	NTST	Duval	20,000
72100	213335-1	9A	16.305	21.403	03/24/04	ETWT	Duval	23,000
72100	208981-2	A1A	15.491	19.800	07/20/04	ETWT	Duval	19,000
72100	403350-4	10	14.373	15.491	07/20/04	ETWT	Duval	21,000
72100	211073-1	10	9.500	10.400	12/07/04	ETWT	Duval	17,000
72140	209537-3	200	9.008	13.587	12/07/04	ST	Duval	13,000
72190	209543-2	212	3.660	6.823	07/19/04	ETWT	Duval	11,000
72220	208718-2	134	0.000	2.572	07/19/04	ETWT	Duval	23,000
72230	208828-2	101	0.383	3.509	07/20/04	NTST	Duval	21,000
74040	210683-3	200	8.513	15.637	08/04/04	NT	NASSAU	14,000
74070	210565-2	115	0.000	5.138	08/04/04	ST	Nassau	13,000
76010	210028-1	15	17.454	23.368	08/17/04	ST	Putnam	13,000
76010	210021-2	15	6.387	12.398	08/17/04	ST	Putnam	13,000

2004 PROJECT LISTING BY DISTRICT

District 3

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
46010	217995-1	30	15.762	16.460	05/10/04	ETWT	Bay	16,000
48006	415373-1	196	0.000	0.530	04/27/04	ETWT	Escambia	14,000
48040	415370-1	95	14.760	23.586	04/28/04	NTST	Escambia	23,000
48050	415376-1	292	6.972	14.938	04/27/04	NT	Escambia	14,000
48060	415377-1	95	0.000	4.550	04/28/04	NTST	Escambia	15,000
48070	415378-1	291	0.109	0.422	04/27/04	NT	Escambia	9,000
48070	415378-1	291	0.422	2.430	04/27/04	NTST	Escambia	11,000
49040	415379-1	30	0.000	10.088	02/03/04	ET	Franklin	12,000
50001	415257-1	8	20.315	31.419	03/10/04	ETWT	Gadsden	17,000
53002	415258-1	8	0.000	10.351	05/12/04	ETWT	Jackson	32,000
53020	415375-1	10	3.336	12.811	03/15/04	WT	Jackson	14,000
53050	415371-1	73	7.021	10.437	03/16/04	NTST	Jackson	22,000
57080	415381-1	4	8.124	12.744	05/11/04	NT	Okaloosa	25,000
58060	415372-1	89	20.715	21.802	05/11/04	ST	Santa Rosa	32,000
61020	415441-1	273	0.000	2.857	03/16/04	NT	Washington	18,000
61060	415382-1	277	0.000	14.211	03/17/04	ST	Washington	14,000

2004 PROJECT LISTING BY DISTRICT
District 4

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
86016	413833-1	848	0.000	2.264	03/23/04	ETWT	Broward	20,000
86028	413838-1	834	1.684	3.240	08/24/04	ETWT	Broward	22,000
86080500	416425-1	84	6.800	8.300	11/23/04	ET	Broward	32,000
86080550	415323-1	84	6.800	8.300	08/25/04	WT	Broward	17,000
86080550	228241-1	84	0.000	2.480	08/25/04	WT	Broward	17,000
86090	413886-1	816	3.110	5.800	11/23/04	ETWT	Broward	17,000
86130	227921-1	814	5.330	7.100	08/24/04	ETWT	Broward	21,000
86190	413834-1	823	2.337	3.687	08/24/04	NTST	Broward	32,000
86190500	413837-1	823	0.000	2.420	08/24/04	NTST	Broward	32,000
86210	415367-1	736	0.176	1.664	08/25/04	ETWT	Broward	19,000
86210	415272-1	736	1.660	2.370	08/25/04	ETWT	Broward	24,000
86220	415322-1	817	15.490	18.000	08/24/04	NTST	Broward	32,000
86470	NA	91	0.000	6.000	4/14/04	NTST	Broward	22000
86470	NA	91	19.000	25.967	4/14/04	NTST	Broward	24000
88050	413803-1	510	5.879	8.485	11/17/04	ET	Indian River	17,000
89070	413844-1	710	0.000	7.300	11/17/04	WT	Martin	20,000
89070	413845-1	710	7.300	17.722	11/18/04	WT	Martin	18,000
89470	413670-1	91	0.000	20.287	5/18/04	NTST	Martin	14000
93004	415308-1	808	2.270	4.870	11/16/04	ETWT	Palm Beach	20,000
93010	413839-1	5	6.800	7.930	11/16/04	NTST	Palm Beach	18,000
93016	229817-1	882	2.769	8.070	04/13/04	ETWT	Palm Beach	18,000
93020002	415851-1	5	0.000	0.291	08/10/04	ETWT	Palm Beach	17,000
93060	403604-1	A1A	0.000	4.559	01/14/04	NT	Palm Beach	22,000
93060	403606-1	A1A	10.270	15.698	10/22/04	NT	Palm Beach	32,000
93110	405315-1	80	0.600	2.540	08/11/04	ETWT	Palm Beach	8,000
93130	415316-1	15	0.260	3.030	11/16/04	NTST	Palm Beach	9,000
93160	403617-1	25	5.892	16.050	01/14/04	NTST	Palm Beach	18,000
93160	403618-1	25	16.050	26.170	08/11/04	NTST	Palm Beach	22,000
93190	413843-1	706	12.200	13.740	08/10/04	NTST	Palm Beach	26,000
93210	415318-1	7	0.000	2.980	11/16/04	NTST	Palm Beach	29,000
93310	413798-1	710	7.880	11.800	08/10/04	ETWT	Palm Beach	25,000
94005	413846-1	615	2.474	3.710	06/21/04	NTST	St Lucie	25,000
94470	411533-3	91	0.000	14.600	5/5/04	NTST	St Lucie	18000
94470	411533-3	91	33.100	35.100	5/5/04	NTST	St Lucie	22000

2004 PROJECT LISTING BY DISTRICT
District 5

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
11070	238429-3	50	13.200	15.650	12/14/04	ETWT	Lake	20,000
11080	415516-1	19	0.000	0.925	04/08/04	ST	Lake	24,000
11200	238422-1	25	3.728	10.258	04/05/04	ST	Lake	21,000
11200	238423-1	25	10.258	14.943	04/05/04	ST	Lake	24,000
36004	415523-1	464	1.232	7.213	05/03/04	ETWT	Marion	24,000
36040	415511-1	200	14.161	16.652	01/22/04	NTST	Marion	18,000
36210	415555-1	93	0.000	13.945	08/02/04	NTST	Marion	32,000
36220	415524-1	500	0.000	8.760	02/18/04	NTST	Marion	22,000
70008	237565-1	513	1.913	5.059	12/13/04	NT	Brevard	21,000
70150	415508-1	46	5.503	6.237	01/28/04	WT	Brevard	16,000
70160	415518-1	405	0.000	5.422	01/28/04	NT	Brevard	18,000
75037	415512-1	434	0.000	2.676	02/19/04	NTST	Orange	15,000
75040	415525-1	527	18.074	18.455	12/02/04	ETWT	Orange	19,000
75050	239535-2	50	1.400	3.080	12/14/04	ETWT	Orange	19,000
75060	415513-1	50	19.595	25.398	03/15/04	ETWT	Orange	16,000
75090	415525-1	426	0.000	4.537	02/19/04	ETWT	Orange	19,000
75230	415519-1	438	5.220	7.151	03/15/04	WT	Orange	20,000
77010	415527-1	15	5.937	10.471	07/28/04	NTST	Seminole	11,000
77010	414779-1	15	0.000	1.042	09/20/04	NTST	Seminole	15,000
77030	415520-1	46	3.299	8.448	02/17/04	ETWT	Seminole	14,000
77120	415514-1	434	1.882	4.968	02/17/04	ETWT	Seminole	18,000
79100	415526-1	40	0.000	6.535	02/03/04	ET	Volusia	11,000
79270	415464-1	483	0.000	3.377	05/28/04	NTST	Volusia	19,000
92060	415510-1	15	4.333	6.554	01/27/04	NT	Osceola	10,000
92070	415509-1	60	3.547	8.114	01/27/04	ET	Osceola	19,000

2004 PROJECT LISTING BY DISTRICT
District 6

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
87002	414617-1	823	7.922	9.699	02/10/04	NTST	Dade	18,000
87012	414620-1	847	0.000	2.144	02/10/04	ST	Dade	19,000
87047	414627-2	973	2.920	5.945	03/09/04	NTST	Dade	32,000
87060	414635-1	A1A	0.872	2.715	03/09/04	NTST	Dade	31,000
87060	410645-1	A1A	6.654	8.692	03/11/04	NTST	Dade	19,000
87066	407591-2	922	1.871	3.063	02/11/04	ETWT	Dade	26,000
87072	414642-1	985	3.004	4.170	03/10/04	NTST	Dade	32,000
87080	410646-1	934	0.000	2.678	02/11/04	ETWT	Dade	18,000
87120	414646-1	90	15.443	17.525	03/10/04	ET	Dade	32,000
87170	407630-1	826	3.701	5.727	02/10/04	ETWT	Dade	26,000
87170	412637-1	826	0.000	1.990	02/10/04	ETWT	Dade	21,000
87170	412637-2	826	1.990	3.557	02/10/04	ETWT	Dade	26,000
87190	412754-2	909	0.000	2.805	02/10/04	NTST	Dade	21,000
87240	414688-1	9	0.056	1.801	03/09/04	NTST	Dade	32,000
87281	407633-1	953	0.000	2.617	03/10/04	NTST	Dade	32,000
90000	251457-2	Flagler Ave	0.000	1.900	03/24/04	ETWT	Dade	32,000
87471	406096-1	821	0.000	40.150	10/12/04	NTST	Monroe	32000
90030	414648-1	5	6.129	7.100	03/24/04	NT	Monroe	14,000
90060	414649-1	5	13.032	16.384	03/24/04	NT	Monroe	32,000

2004 PROJECT LISTING BY DISTRICT
District 7

Section Number	Work Project Number	State Road	BMP	EMP	Date Tested	Lanes Tested	County	M_R (psi)
02030	405822-4	55	13.524	14.396	12/06/04	NTST	Citrus	19,000
02050	257182-2	44	0.565	2.453	12/06/04	ETWT	Citrus	20,000
08060	406543-1	50	2.049	6.041	4/20/04	WT	Hernando	21,000
08070	415185-1	50	0.000	5.236	12/01/04	ETWT	Hernando	27,000
08080	403724-1	700	0.120	1.937	12/01/04	NTST	Hernando	18,000
10020	255508-1	685	0.000	3.189	03/31/04	NT	Hillsborough	17,000
10040	255832-1	45	7.392	8.101	03/31/04	NTST	Hillsborough	16,000
10060	411276-1	45	17.392	22.495	03/30/04	NTST	Hillsborough	20,000
10080	255803-1	60	3.081	4.554	03/02/04	ETWT	Hillsborough	17,000
10080	406189-1	60	2.734	3.081	03/02/04	ETWT	Hillsborough	16,000
10080	255828-1	60	1.047	2.734	03/02/04	ETWT	Hillsborough	13,000
10110	413395-1	60	11.690	16.432	03/02/04	ETWT	Hillsborough	26,000
10110	411266-1	60	7.229	9.939	03/31/04	ETWT	Hillsborough	25,000
10120	408920-1	674	0.000	2.452	03/30/04	ETWT	Hillsborough	23,000
10160	411332-1	597	4.846	8.770	06/14/04	NTST	Hillsborough	21,000
14010	411334-1	45	11.340	19.676	05/24/04	ST	Pasco	16,000
14050	403727-1	39	13.420	14.580	04/20/04	ST	Pasco	14,000
14050	256422-2	41	3.901	5.738	08/17/04	ST	Pasco	23,000
14070001	258739-1	CR 41	0.000	0.800	6/22/04	ET	Pasco	32,000
14120	403780-1	52	23.372	26.556	04/21/04	ET	Pasco	20,000
14120	403781-1	52	26.560	30.038	04/21/04	ET	Pasco	19,000
14120	256323-1	52	9.063	12.816	04/21/04	WT	Pasco	17,000
14130	413394-1	533	0.000	1.602	12/01/04	ST	Pasco	22,000
14150	411325-1	575	0.000	2.241	04/20/04	ST	Pasco	15,000
15020	257078-1	595	10.645	12.576	04/22/04	ST	Pinellas	18,000
15050	403726-1	590	9.271	10.300	09/22/04	ET	Pinellas	10,000
15140	257129-1	699	0.000	1.510	11/30/04	NTST	Pinellas	15,000
15190	413413-1	93	14.441	16.649	06/14/04	NTST	Pinellas	30,000

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