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PERPETUAL PAVEMENT DEMONSTRATION PROJECT ON US-24 IN DETROIT – CONSTRUCTION REPORT

MDOT
Michigan Department of Transportation

CONSTRUCTION AND TECHNOLOGY DIVISION

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16. Abstract

This report summarizes the design and construction of the first asphalt "perpetual" pavement project by the Michigan Department of Transportation. The project occurred on a 1.18 mile stretch of northbound US-24, which is a seven to eight lane boulevard along this section, in Detroit.

The pavement structure was removed down to the original subgrade and then rebuilt. The new cross-section consists of 10 inches of asphalt over 12 inches of aggregate base over 14 inches of sand subbase. A geotextile separator was included between the base and subbase, and 6 inch underdrain was trenched in for drainage.

Two types of subgrade exist on the project: sand and clay. A 492 foot (150 meter) test section was set up for each of the two different subgrades. In-place soil and asphalt properties were tested in the test sections for each layer. Nuclear gauge, GeoGauge™, and dynamic cone penetrometer testing occurred on each soil layer. Nuclear gauge and falling weight deflectometer testing occurred on each of the three asphalt layers.

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MICHIGAN DEPARTMENT OF TRANSPORTATION
MDOT

PERPETUAL PAVEMENT DEMONSTRATION PROJECT ON US-24 IN DETROIT - CONSTRUCTION REPORT

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Construction and Technology Division
Work Plan No. 02 WP-146
Research Project D-0066
Research Report R-1431

Lansing, April, 2004

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EXECUTIVE SUMMARY

This report summarizes the design and construction of the first asphalt "perpetual" pavement project by the Michigan Department of Transportation (MDOT). The project occurred on a 1.18 mile stretch of northbound US-24, which is a seven to eight lane boulevard along this section, in Detroit, with a posted speed limit of 45 miles per hour.

The pavement structure was removed down to the original subgrade and then rebuilt. The new cross-section consists of 10 inches of asphalt over 12 inches of aggregate base over 14 inches of sand subbase. A geotextile separator was included between the base and subbase, and 6 inch underdrain was trenched in for drainage.

Two types of subgrade exist on the project: a sand and a clay. A 492 foot (150 meter) test section was set up for each of the two different subgrades. In-place soil and asphalt properties were tested in the test sections for each layer. Nuclear gauge, GeoGauge™, and dynamic cone penetrometer testing occurred on each soil layer. Nuclear gauge and falling weight deflectometer testing occurred on each of the three asphalt layers.

INTRODUCTION

In 2002, Michigan decided to join a growing list of states utilizing the perpetual pavement concept for high-volume roadways. Full-depth and deep-strength asphalt pavements have been around since the 1960's.[1] However, the term perpetual pavement is relatively new and has renewed nationwide interest in building long-life asphalt pavements.

In the perpetual pavement concept, a base course that combines adequate thickness and flexibility to resist fatigue cracking is followed with a rut resistant and durable intermediate, or leveling, course. Finally, a rut resistant and wear resistant surface course is placed.[2] While no pavement will last forever, perpetual pavements placed on a strong, well-drained soil foundation, and with occasional rehabilitation work such as cold-milling and resurfacing, can potentially last 50 years or more.

BACKGROUND

The Michigan Asphalt Paving Association (MAPA) approached the MDOT about constructing a perpetual pavement demonstration project. A section of northbound US-24 in Detroit was selected as the demonstration location. The pavement in this location was already being considered for reconstruction. Although MAPA later withdrew their support, it was decided to continue with evaluation of this project.

The project begins at Puritan Avenue and proceeds north for 1.2 miles to M-5. There is one major intersection (6 Mile Road) right in the middle of the project. In the area of the demonstration project, US-24 is a boulevard section with four lanes in the northbound direction and three lanes in the southbound direction. Northbound US-24 was originally constructed in 1929 as a 20 foot wide concrete pavement. In 1932, it was widened out an additional 20 feet with concrete. Another 11 feet of widening and bituminous overlay occurred in 1959. Also in 1959, this roadway was turned into a boulevard with the paving of a second roadbed that would carry southbound traffic. The last record of work occurred in 1973 with a one-course, bituminous overlay of northbound. The demonstration project is on the northbound side only.

Several cores were taken in 1999. They show that the existing cross-section was 4 to 4-1/2 inches of asphalt over 9 to 11 inches of concrete. The original concrete was built directly on a fine sand or sandy clay. Curb and gutter run the length of the project on both sides. Average daily traffic for 2002 was 79,200 vehicles with 2.5 percent commercial.

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[1] Huddleston, Jim, M. Buncher, D. Newcomb, *perpetual pavements*. A concept paper, Asphalt Pavement Alliance

[2] Michigan Asphalt Paving Association website, www.miasphalt.com

DESIGN

Pavement Cross-Section

MAPA contracted with Harold Von Quintus of Fugro-BRE, Inc., to design a perpetual pavement using mechanistic-empirical methods. Mr. Von Quintus' report can be found in Appendix A. The pavement design recommendations from that report were used on the demonstration project.

Mr. Von Quintus considered seven different cross-sections of varying layer thicknesses, materials, and gradations. The basic assumptions were:

- 20 year design life
- Design traffic of 3.7 million Equivalent Single Axle Loads (ESAL's)
- Subgrade modulus of 3,000 psi
- Sand Subbase modulus of 10,000 psi
- Aggregate Subbase modulus of 15,000 psi (was not used in the final design)
- Aggregate Base modulus of 20,000 psi

Limiting factors used to determine layer thicknesses were:

- Maximum tensile strain at the bottom of the asphalt of 0.000145 in./in.
- Maximum vertical compressive strain at the top subgrade soil of 0.000341 in./in.
- Maximum surface deflection of 0.0255 inches
- Minimum of 36 inches of non-frost susceptible materials

The recommended cross-section can be found in Table 1.

Table 1. Recommended cross-section.		
Layer	**Material**	**Thickness, in.**
Wearing Course	4E10 mix using PG 70-28 binder	2.5
Leveling Course	3E10 mix using PG 70-22 binder	3.0
Base Course	2E10 mix using PG 70-22 binder	4.5
Base	21AA dense-graded aggregate	12.0
Subbase	sand	14.0

Other recommendations were:

- 4 percent air voids and 93 percent to 95 percent density for the asphalt wearing and leveling courses.
- 3 percent air voids and 94 percent to 96 percent density for the asphalt base course.
- Geotextile separator to keep base and subbase from mixing.

Adjacent Project

As stated earlier, this demonstration project is only on the northbound side of US-24. The original project was to be on US-24 from I-96 2.7 miles north to M-5. The northbound was to be reconstructed and the southbound was to receive concrete repairs and an asphalt overlay. The northbound portion from Puritan to M-5 was removed from that original project and designed as the demonstration project. The remainder of the original project, all of southbound and northbound from I-96 to Puritan, remained the same. The original project and the demonstration project were let separately, but it was anticipated that they would be constructed at the same time.

Test Sections

Two 150 meter (the project was designed and built using metric units) test sections were set up. In these test sections MDOT would test the in-situ properties of each layer from the subgrade up through the asphalt. Two test sections were chosen because it was noticed that the subgrade was different on the north end of the project from the south end. North of Six Mile Road the subgrade appeared to be several feet of sand over clay while south of Six Mile Road it was primarily clay.

Warranty

MDOT decided to place a five-year warranty provision on this project. Each warranted lane is divided into consecutive 160 meter segments. Within each segment there is a threshold limit for each of the condition parameters (defects) that are being looked for. If the threshold limit is exceeded for a condition parameter on a minimum number of segments (usually 1 or 2), then warranty work is required for that condition parameter. Each condition parameter is evaluated and segments counted separately to check for warranty violation. By doing this, one or more condition parameters may trigger warranty work, while the remainder do not. Recommended corrective actions for each condition parameter are also included. However, the contractor can submit an alternative, but must obtain MDOT approval first.

For this project, the condition parameters were: transverse cracking, longitudinal cracking/open longitudinal joint, de-bonding, raveling, flushing, rutting, and ride quality. The warranty special provision can be found in Appendix B. The special provision contains the details on threshold limits and maximum allowable defective segments.

CONSTRUCTION

Construction of the demonstration project began on May 20, 2002, with adjusting drainage structures and temporary asphalt widening. Pavement removal began around June 13, 2002. The plan was to remove, and then pave, two lanes at a time. The rightmost lanes were first.

After the pavement was removed down to the existing subbase, work began on rebuilding the cross-section. Figures 1, 2, and 3 show the cross-section of the old roadway.

Figure 1. Cross-section of the existing roadway. Red marks on the ruler are every 10 centimeters.

Figure 2. Depth to top of existing concrete.

Figure 3. Depth to bottom of existing concrete (at roughly the 35 centimeter mark).

Six-inch diameter underdrain pipe was trenched in and backfilled with pea stone. The pipe was placed near the roadway centerline under the second lane from the right, and under the curb and gutter on both sides. Figure 4 shows the centerline pipe in place.

Figure 4. Underdrain in place and partially backfilled.

Sand subbase placement began on July 10 working from the south end of the project toward the north. Placement of the open-graded aggregate base began approximately August 2, at intermittent locations. Once the aggregate base was compacted and trimmed to the correct grade, the right side curb and gutter was placed.

Paving of the asphalt base course began on August 21. MDOT inspectors noted several locations of segregation in the base course and told the contractor that they wanted it removed and re-paved. Construction was on-hold for two months while negotiations were on-going as to whether the base course would be removed. Finally, the contractor agreed to mill and re-pave 3¼ inches of the 4 ½ inch thickness at no cost to MDOT. Once this was done, the leveling course was paved, the pavement received temporary striping, and traffic was switched over on October 13. The wearing course would be paved full-width once the other two lanes were completed.

Work on the left two lanes proceeded in the same order as the right two lanes. Placement of the sand subbase began on October 21, and placement of the aggregate base began on October 25 . Subbase and base placement were occurring at the same time, but base was placed only in areas where the minimum density had been obtained in the subbase. Once the aggregate base was compacted and trimmed to the correct grade, the left side curb and gutter was placed.

Paving began on the left two lanes began on November 9, with the base course followed by the leveling course. Each course, at this stage, included paving of the turn lanes and turn around areas in the median of the boulevard. The wearing course was paved from November 24 to November 27. Air temperatures during this phase of paving started out in the mid 30's to upper 40's (fahrenheit). At the end of paving, temperatures were typically between 25°F and 35°F.

Figure 5. Type of paver used to place the asphalt.

Figure 5 shows the paver used to pave each lane. Toward the end of the project, as colder temperatures became more prevalent, a second paver was used to speed construction. For each layer, the leftmost and rightmost lanes were paved using the curb and gutter for grade control as shown in Figure 6. The middle two lanes used the two outside lanes for grade control as shown in Figure 7.

Figure 6. Grade control used for lanes next to curb and gutter.

Figure 7. Grade control used for middle two lanes. Note wheeled ski on right side behind the paver.

TESTING

As mentioned earlier, two 492 foot (150 meter) test sections were set up to test in-situ properties on each pavement layer. Test section 1 is from station 29+900 to station 30+050 (metric stationing). This test section is at the south end of the project and contains clay for the existing soils that the new roadway cross-section will be built on. Test section 2 was originally from station 31+100 to station 31+250. However, a water main valve was leaking, creating a saturated soil condition for about one-third of the test section as seen in Figure 8. Accurate testing of the existing soils would not be possible so the test section was moved out of the saturated area and is now from station 30+950 to station 31+100. The valve was fixed after testing within the new section had begun. This test section is closer to the north end of the project and contains a fine sand for the existing subgrade.

Figure 8. Saturated soil condition in test section 2 created by leaking water main valve.

Tests were conducted every 66 feet (20 meters) in the center of each lane. Stakes were set up in the shoulder every 66 feet (20 meters) so that tests conducted on each layer were conducted in the same spot as the layer(s) below it. At each stake the distance to the center of the lane was measured and a 1 ½ foot diameter circle was painted. Tests were then conducted within the circle. Tests conducted on the soil layers were: densities with a nuclear gauge, dynamic cone penetrometer, and the GeoGauge™. Falling Weight Deflectometer (FWD) tests were also conducted on some of the lanes and layers. Tests conducted on the asphalt layers were: densities with a nuclear gauge and FWD testing.

The nuclear gauge is the standard for checking densities of soil and asphalt layers in Michigan. The GeoGauge™ (Figure 9) is a relatively new instrument made by the Humboldt Manufacturing Company. It is described as a portable device for rapidly checking the stiffness and modulus of compacted soils. It also provides a way to estimate modulus of subgrade reaction, California Bearing Ratio (CBR) and soil density. It does this by way of a circular foot that imparts deflections in the soil at various frequencies and measures the impedance at the soil surface.[3] At the time of the project, Michigan was participating in a national pooled-fund study looking at the use of the GeoGauge™ as a quality control check on compacted soil layers. This project was seen as a way to check the practicality of its use and compare it with the nuclear gauge. Since CBR is one of the properties the GeoGauge™ can estimate, the dynamic cone penetrometer was used as a comparison.

Figure 9. GeoGauge™ device used to check soil stiffness and modulus.

All data from tests conducted in these two test sections can be found in Appendix C. What follows is a discussion of preliminary analysis of some of that data. Tables 2, 3, and 4 show the average results for the nuclear gauge, GeoGauge™, and dynamic cone penetrometer, respectively. In all cases, lanes are numbered starting with the rightmost lane (in the direction of traffic) being lane 1.

[3] GeoGauge™ User Guide, Humboldt Manufacturing Company

Table 2. Dry Density and % Compaction Averages of Soil Layers From Nuclear Gauge

Site 1								Site 2							
Lane 1		Lane 2		Lane 3		Lane 4		Lane 1		Lane 2		Lane 3		Lane 4	
DD	%	DD	%	DD	%	DD	%	DD	%	DD	%	DD	%	DD	%
Clay Subgrade								Sand Subgrade							
106.4	94.6	113.1	100.9	NA	NA	NA	NA	110.1	101.2	108.0	99.3	NA	NA	NA	NA
Sand Subbase								Sand Subbase							
128.6	93.5	128.8	93.6	NA	NA	NA	NA	131.1	98.3	134.8	101.1	NA	NA	NA	NA
Aggregate Base								Aggregate Base							
125.2	95.4	125.9	96.0	120.1	95.5	123.8	98.5	124.9	95.2	126.4	96.4	112.5	90.2	121.1	97.1

DD = Dry Density, lb/ft^3 ; % = % Compaction ; NA = No test (nuclear gauge technician unavailable)

Table 3. Soil Stiffness and Elastic Modulus Averages of Soil Layers From GeoGauge

Site 1								Site 2							
Lane 1		Lane 2		Lane 3		Lane 4		Lane 1		Lane 2		Lane 3		Lane 4	
SS	E	SS	E	SS	E	SS	E	SS	E	SS	E	SS	E	SS	E
Clay Subgrade								Sand Subgrade							
61.48	12.99	75.20	15.86	30.61	6.52	23.24	4.90	26.54	5.60	28.05	5.92	26.37	5.56	20.48	4.32
Sand Subbase								Sand Subbase							
48.03	10.13	51.84	10.94	40.53	8.55	45.63	9.62	18.26	3.87	24.80	5.17	36.43	7.68	43.72	9.19
Aggregate Base								Aggregate Base							
48.96	10.82	52.37	11.05	49.47	10.44	52.20	10.57	52.65	11.11	63.85	13.46	47.98	10.09	55.02	11.60

SS = Soil Stiffness, kip/in ; E = Elastic Modulus, kip/in^2

Table 4. CBR and Elastic Modulus Averages of Soil Layers from DCP

Site 1								Site 2							
Lane 1		Lane 2		Lane 3		Lane 4		Lane 1		Lane 2		Lane 3		Lane 4	
CBR	E	CBR	E	CBR	E	CBR	E	CBR	E	CBR	E	CBR	E	CBR	E
Clay Subgrade								Sand Subgrade							
5	6.95	5	6.65	4	5.91	3	5.06	4	6.07	6	7.89	7	8.79	5	7.18
Sand Subbase								Sand Subbase							
9	10.49	12	11.88	11	11.45	14	13.59	8	9.03	15	13.67	9	10.19	16	14.57
Aggregate Base								Aggregate Base							
14	13.38	15	13.79	15	14.06	20	17.12	13	12.76	16	14.27	19	16.09	21	17.36

CBR = California Bearing Ratio, percent ; E = Elastic Modulus, kip/in^2 ; all values calculated using a spreadsheet file provided by Kessler Soils Engineering, Inc.

One item to note from Table 3 is the disparity between first two lanes and the second two lanes of site 1 in the subgrade. The soil stiffness and moduli values are much higher for lanes 1 and 2 than for lanes 3 and 4. The difference cannot be accounted for.

Since elastic moduli values were found with the GeoGauge and the Dynamic Cone Penetrometer, a comparison was made between the results. Figures 10, 11, and 12 show the comparison for the subgrade, subbase, and base layers, respectively. As can be seen in the charts, the GeoGauge results are consistently lower than the Dynamic Cone Penetrometer results except for lanes 1 and 2 in the subgrade, which were just discussed.

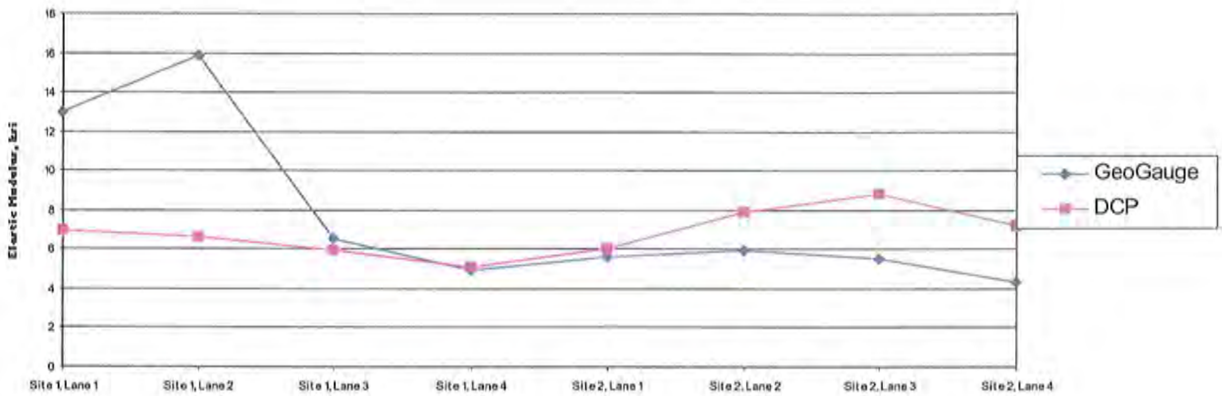

Figure 10 Comparison of GeoGauge and DCP Moduli Values For Subgrade Layer

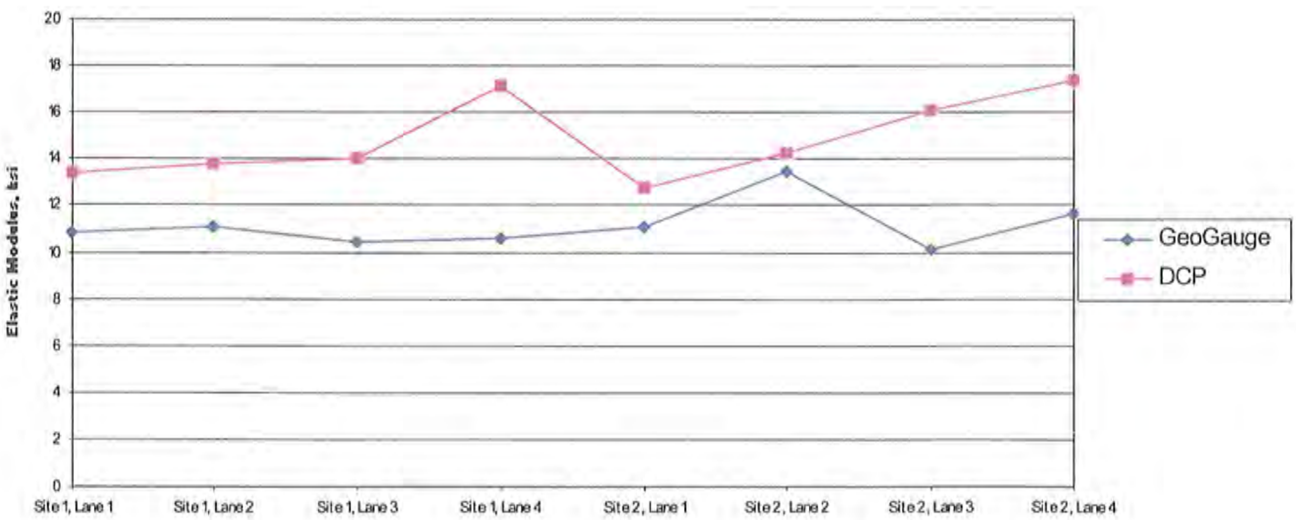

Figure 11. Comparison of GeoGauge and DCP Moduli Values For Base Layer

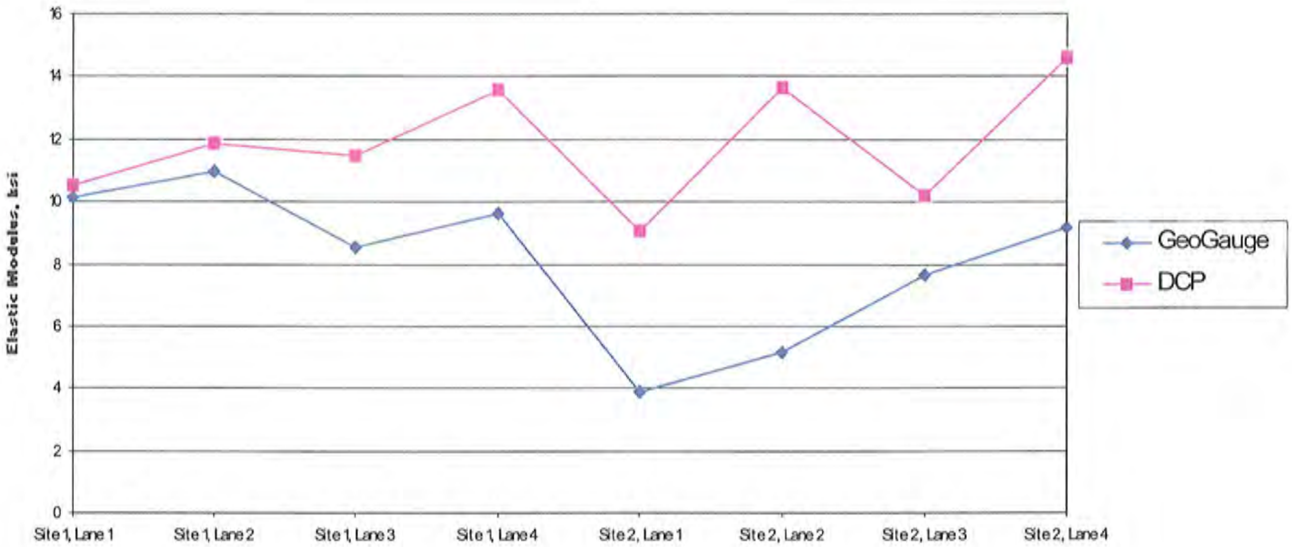

Figure 12. Comparison of GeoGauge and DCP Moduli Values For Subbase Layer

Table 5 shows the average percent compaction of each of the asphalt layers as measured by the nuclear gauge.

Table 5. Percent Compaction Averages of Asphalt Layers from Nuclear Gauge

Layer	Site 1				Site 2			
	Lane 1	Lane 2	Lane 3	Lane 4	Lane 1	Lane 2	Lane 3	Lane 4
Base	88.1	95.1	NA	92.9	95.3	94.4	NA	93.2
Leveling	93.3	90.7	92.7	92.0	90.3	91.1	93.0	92.2
Wearing	93.7	93.6	93.9	95.1	94.5	93.4	93.9	94.8

NA = No test (nuclear gauge technician unavailable)

Backcalculation of the layer moduli was also done from FWD data collected after the final lift of asphalt was placed. MICHBACK, developed by Michigan State University, and Modulus 5.1, developed by the Texas Transportation Institute were used for the backcalculation. Tables 6 and 7 show the results from the two programs. Only three layers can be used in the MICHBACK program, so the base and subbase were combined into one layer. Modulus 5.1 can handle more than three layers so the base and subbase were entered separately.

MICHBACK generally calculated a higher modulus for the asphalt than Modulus 5.1 . The moduli of the combined base/subbase layer in MICHBACK was typically much lower than either of the moduli for the base or subbase from Modulus 5.1 . MICHBACK was also consistently higher than than Modulus 5.1 in calculating the subgrade modulus. Conclusions about the validity of one program over the other can not be drawn because of the need to combine the base and subbase layers into one layer in MICHBACK.

Table 6. Average Backcalculation Results From MICHBACK

Section	Lane	Surface Temp, °F	Asphalt, ksi	Base and Subbase, ksi	Subgrade, ksi	AASHTO corrected subgrade, psi
1	1	57	1647	14.6	16.5	5445
1	2	61	1022	12.1	17.8	5879
1	3	61	1196	6.6	19.1	6318
1	4	64	972	10.0	14.2	4694
2	1	65	1016	15.0	21.0	6934
2	2	70	1171	16.5	20.8	6870
2	3	62	1170	11.7	17.7	5854
2	4	50	2558	8.1	20.0	6606

Table 7. Average Backcalculation Results From Modulus 5.1							
Section	**Lane**	**Surface Temp, °F**	**Asphalt, ksi**	**Base, ksi**	**Subbase, ksi**	**Subgrade, ksi**	**AASHTO corrected subgrade, psi**
1	1	57	1541	22.6	22.2	13.6	4500
1	2	61	976	16.7	21.4	12.3	4051
1	3	61	1119	12.6	17.6	10.3	3395
1	4	64	911	14.6	23.8	9.4	3098
2	1	65	888	27.4	38.2	10.7	3531
2	2	70	912	49.9	32.3	11.6	3832
2	3	62	1386	27.5	14.5	11.9	3935
2	4	50	2104	37.5	29.9	11.7	3857

SUMMARY

- Michigan constructed its first perpetual pavement project on US-24 in Detroit.
- Pavement cross-section was based on a design by Harold Von Quintus of Fugro-BRE, Inc.
- Construction went pretty well other than a two month delay in the middle of the project. The delay was from negotiations between the contractor and Michigan DOT on how much of the asphalt base layer was to be milled off and replaced because it was segregated. This also resulted in final paving being done in cold weather.
- Two 492 foot (150 meter) test sections were set up to test in-place properties of the various layers from subgrade up to the asphalt. The two sections represent two different subgrade materials: one is sand and the other is a clay.
- Test section 2 had to be moved due to saturated soil conditions from a leaking water main valve.
- The GeoGauge™ was used to check soil stiffness and elastic moduli of each of the soil layers for informational purposes. No conclusions about the validity of the GeoGauge™ as a quality control measure of compacted soil layers were made from this project.
- The GeoGauge™ gave consistently higher moduli values for each of the soil layers than the Dynamic Cone Penetrometer.
- Most of the average percent compaction results for all the layers did not meet Mr. Von Quintus' design recommendations of 93 percent to 95 percent for the wearing and leveling course, and 94 percent to 96 percent for the base course.
- Backcalculation from FWD data revealed that the moduli of the subgrade and subbase met Mr. Von Quintus' design assumptions of 3,000 psi and 10,000 psi respectively. Just over half of the lanes had a base modulus that met the design assumption of 20,000 psi from the Modulus 5.1 results. Base and subbase were combined in MICHBACK so conclusions can not be made using this program.

APPENDIX

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PAVEMENT PERFORMANCE WARRANTY ON
US-24 DEMONSTRATION PROJECT

a. Description. The pavement performance warranty shall consist of the warranty bond and the terms of this special provision, including the appendix. This special provision establishes the common terms and definitions applied to all pavement projects requiring a warranty (the warranted work). The appendix contains information unique to each pavement fix. The pavement performance warranty warrants the Department against performance defects in the entire pavement structure. The pavement structure includes all materials above the subgrade.

b. Definitions.

1. Performance Warranty - A document that specifies warranty requirements. If the requirements are exceeded during the warranty period, corrective action will be completed by the Contractor to bring the warranted work back into compliance with the warranty specification, at no cost to the Department.

2. Acceptance Date of Construction - The date when the warranted work is complete and confirmed in writing on the initial acceptance document, by the Department, to be in compliance with the contract specifications and is open to traffic. This is the date of initial acceptance and constitutes the start date for the warranty period. There may be more than one acceptance date of construction for a project.

3. Warranty Bond - A bond issued by a surety which guarantees that the warranty requirements will be met.

4. Conflict Resolution Team (CRT) - The five- person team responsible for resolving disputes between the Department and the Contractor regarding any claim of non-compliance with the warranty requirements.

5. Warranty Lane(s) - The portion of the pavement considered warranted work. Each of the following is considered a separate warranty lane.

   - Each individual mainline lane.
   - The sum of all auxiliary lanes (turn lanes and median crossovers) are considered a single warranty lane.

Approaches, driveways and adjoining transition tapers between various types of pavement are not considered warranty lanes for the purpose of this provision.

6. Warranty Work - Corrective action taken to bring the warranted work into contract compliance.

c. Initial Acceptance. The Department and the Contractor shall jointly review all completed warranted work, or a portion thereof, as determined by the Department. If the work does not meet contract requirements, the Contractor shall make all necessary corrections, at their expense, prior to initial acceptance. Initial acceptance will occur as soon as the Department confirms in writing, on the initial acceptance form, that contract requirements have been met for the warranted work. The date on which initial acceptance occurs is termed the Acceptance Date of Construction.

Initial acceptance will be documented and executed jointly by the Department and the Contractor on a form fumished by the Department. A copy of the form will be sent to the Contractor's warranty bond surety agent by the Department. Neither the initial acceptance nor any prior inspection, acceptance or approval by the Department diminishes the Contractor's responsibility under this warranty.

The Department may accept the work and begin the warranty period, excluding any area needing corrective work, to accommodate seasonal limitations or staged construction.

Acceptance of material, in penalty, under the Department's quality assurance program will not relieve the Contractor from meeting the warranty requirements for the accepted material.

d. Warranty Bond. The Contractor shall furnish a single term warranty bond, in an amount stipulated in the appendix, prior to contract award. The effective starting date of the warranty bond shall be the Acceptance Date of Construction. The warranty bond will be released at the end of the warranty period or after all warranty work has been satisfactorily completed, whichever is latest.

e. Rights and Responsibilities of the Department. The Department:

1. Reserves the right to approve the Contractor proposed schedule and maintaining traffic plan through the Department's utilities and permits process for warranty work.

2. Reserves the right to approve all corrective action, materials and specifications proposed for warranty work.

3. Reserves the right to determine if warranty work performed by the Contractor meets the contract specifications.

4. Reserves the right to perform, or have performed, routine maintenance during the warranty period, which routine maintenance will not diminish the Contractor's responsibility under the warranty.

5. Reserves the right, if the Contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this

requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the Contractor unless it is determined that the unsafe condition was caused by something beyond the Contractor's control.

6. Is responsible for monitoring the pavement throughout the warranty period and will provide the Contractor all written reports of the surface treatment's condition related to the warranty requirements. The Contractor shall not be relieved of any responsibility based upon a claim that the Department failed to adequately monitor the pavement or to report its findings to the Contractor.

7. Is responsible for notifying the Contractor, in writing, of any corrective action required to meet the warranty requirements.

f. **Rights and Responsibilities of the Contractor.** The Contractor:

1. Shall warrant to the Department that the warranted work will be free of performance defects as defined by the warranty requirements. The warranty bond shall be described on a form furnished by the Department. The completed form shall be submitted to the Department prior to award of contract.

2. Is responsible for performing all warranty work including, but not limited to, maintaining traffic and restoring all associated pavement features, at the Contractor's expense.

3. Is responsible for performing all temporary or emergency repairs, resulting from being in non-compliance with the warranty requirements, using Department approved materials and methods.

4. Shall notify the Department and submit a written course of action for performing the needed warranty work a minimum of ten calender days prior to commencement of warranty work, except in the case of emergency repairs as detailed in this special provision. The submittal must propose a schedule for performing the warranty work and the materials and methods to be used.

5. Shall follow a Department approved maintaining traffic plan when performing warranty work. All warranty work shall be performed under permit issued by the Region Utilities & Permits Engineer.

6. Is required to supply to the Department original documentation that all insurance required by the contract is in effect during the period(s) that warranty work is being performed, as required by subsection 107.10 of the 1996 Standard Specifications for Construction.

7. Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any warranty work being performed. These supplemental bonds shall be furnished prior to beginning any warranty work, using Department approved forms. These supplemental bonds shall be in the amount required by the Department to cover the costs of warranty work.

8. Shall complete all warranty work prior to conclusion of the warranty period, or as otherwise agreed to by the Department.

9. Shall be liable during the warranty period in the same manner as contractors currently are liable for their construction related activities with the Department pursuant to the 1996 Standard Specifications for Construction, including, but not limited to subsections 103.06, 107.10 and 107.11. This liability shall arise and continue only during the period when the Contractor is performing warranty work. This liability is in addition to the Contractor performing and/or paying for any required warranty work, and shall include liability for injuries and/ or damages and any expenses resulting therefrom which are not attributable to normal wear and tear of traffic and weather, but are due to non-compliant materials, faulty workmanship, and to the operations of the Contractor as set forth more fully in subsections 103.06, 107.10 and 107.11 of the 1996 Standard Specifications for Construction.

g. Evaluation Method. The Department will conduct pavement evaluations by dividing the project into segments. Each individual warranty lane will be divided into segments of 160 meters in length for measuring and quantifying the condition parameters. Evaluation will include use of both the Department's Pavement Management System and/or field pavement condition reviews. This evaluation may be waived in emergency situations.

The beginning point for laying out segments will be the Point of Beginning (POB) of the project. Segments will be laid out consecutively to the Point of Ending (POE) of the project. The original segmentation of the project will be used for all successive reviews throughout the warranty period.

h. Warranty Requirements. Warranty work will be required when both of the following criteria are met.

Criterion 1 - The threshold limit for a condition parameter is exceeded, and

Criterion 2 - The maximum allowable number of defective segments is exceeded for one or more condition parameters for a warranty lane.

Specific threshold limits and segment limits are covered in the appendix.

During the warranty period, the Contractor will not be held responsible for pavement distresses that are caused by factors not related to design, workmanship or materials. These include, but are not limited to: chemical and fuel spills, vehicle fires, snow plowing, and quality assurance testing such as coring. Other factors considered to be beyond the control of the Contractor which may contribute to pavement distress will be considered by the Engineer on a case by case basis upon receipt of a written request from the Contractor.

i. Conflict Resolution Team. The sole responsibility of the Conflict Resolution Team (CRT) is to provide a decision on disputes between the Department and the Contractor regarding application or fulfillment of the warranty requirements. The CRT will consist of five members:

- Two members selected, and compensated by the Department.
- Two members selected and compensated by the Contractor.
- One member mutually selected by the Department and the Contractor. Compensation for the third party member will be equally shared by the Department and the Contractor.

If a dispute arises on the application or fulfillment of the terms of this warranty, either party may serve written notice that appointment of a CRT is required.

At least three members of the CRT must vote in favor of a motion to make a decision. The CRT may decide to conduct a forensic investigation, will determine the scope of work and select the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Contractor and the Department based on the determined cause of the condition.

j. Emergency Repairs. If the Department determines that emergency repairs are necessary for public safety, the Department or it's agent may take repair action. Emergency repairs must be authorized by the Region Engineer.

Prior to emergency repairs, the Department will document the basis for the emergency action. In addition, the Department will preserve evidence of the defective condition.

k. Non-extension of Contract. This Special Provision shall not be construed as extending or otherwise affecting the claim process and statute of limitation applicable to this Contract.

l. Measurement and Payment. All costs, including engineering and maintaining traffic costs, associated with meeting the requirements of this special provision are considered to be included in the Contract unit prices for the warranted work items regardless of when such costs are incurred throughout the warranty period. These costs include, but are not limited to, all materials, labor and equipment necessary to complete the required warranty work.

PAVEMENT PERFORMANCE WARRANTY APPENDIX FOR

NEW/RECONSTRUCTED BITUMIONOUS PAVEMENT ON US-24 DEMONSTRATION PROJECT

A1. **Application.** This appendix applies to pavement warranties on new and reconstructed bituminous pavement placed on an unbound or stabilized aggregate base.

A2. **Limits of Warranted Work.** The warranted work includes all bituminous on warranty lanes within the project limits unless otherwise indicated on the plans.

A3. **Warranty Term.** The warranty term will be five years from the date of Initial Acceptance otherwise termed the Acceptance Date of Construction.

A4. **Warranty Bond.** The Contractor will supply a warranty bond equal to $150,000. or five percent of the total contract amount, whichever is less.

A5. **Initial Ride Quality Acceptance Criteria.** Initial Ride Quality requirements are specified in other contract documents.

A6. **Condition Parameters.** Condition parameters are used to measure the performance of the bituminous pavement during the warranty term. Each condition parameter has a threshold level applied to each segment and a maximum number of defective segments allowed before corrective action (warranty work) is required.

<u>Definitions</u>

Transverse Crack - A crack , at least 1.5 meters in length, that is oriented primarily in the transverse direction versus the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees. It can be either straight or irregular in direction.

Longitudinal Crack/Open Joint - A crack or open joint, at least 1.5 meters in length, that is oriented primarily in the longitudinal direction versus the transverse direction. That is, the angle between the overall crack line and the centerline is less than 45 degrees. It can exist anywhere in the driving lane; i.e., at the pavement centerline joint, wheel path, center of lane, or lane/shoulder joint.

De-bonding - A physical separation of two bituminous layers. De-bonding will be visually identified as shoving, or the loss of the surface course. Surface potholes, regardless of depth, will be classified as de-bonding.

Raveling - Surface disintegration, due to the loss of coarse or fine aggregate material, that occurs over an area or in a continuous longitudinal strip.

Flushing - The accumulation of excess asphalt binder on the pavement surface that creates a shiny, reflective condition and becomes tacky to the touch at high temperatures.

Rutting - A longitudinal surface depression in the wheel path. It may have associated transverse displacement or humping.

Alligator Cracking - Parallel longitudinal cracks with transverse tears between them exhibiting a pattern similar to an alligator hide. An Alligator Crack typically initiates in a wheel path and may extend to other lane locations.

Block Cracking - Transverse and longitudinal cracking that has progressed to a pattern that the pavement is broken into blocks sized less than 3.6m x 3.6m. The shape of each block may be irregular.

Ride Quality Index (RQI) - a representation of the roadway profile and the resulting pavement ride quality expressed in terms of the Michigan Ride Quality Index.

A7. Warranty Requirements. The table lists the allowable threshold limit for each condition parameter within each segment and the maximum number of allowable segments within a warranty lane for each condition parameter. If any of the warranty requirements are not met corrective action (warranty work) is required.

The defective segments for surface distress may or may not be contiguous to necessitate corrective action. The maximum allowable number of defective segments for each condition parameter applies to each driving lane in each travel direction. Each warranty lane shall be evaluated independent of adjacent warranty lanes. Any pavement surface requiring removal/replacement to correct deficiencies, for any condition parameter, shall be replaced full-width across the warranty lane.

WARRANTY REQUIREMENTS		
CONDITION PARAMETER [(1)]	THRESHOLD LIMITS PER SEGMENT (Length = 160 m)	MAX. DEFECTIVE SEGMENTS PER WARRANTY LANE
Transverse Cracking	2	2
Longitudinal Cracking/ Open Joint	10% of segment length	2
De-bonding	5% of segment length	2
Raveling	8% of segment length	2
Flushing	4% of segment length	2
Rutting [(3)]	ave. rut depth = 10 mm [(2)]	2.
RQI	45	1 [(4)]

(1) Alligator and/or Block Cracking will not be an acceptable condition, and will be removed and replaced as approved by the Engineer.
(2) The rut depth threshold applies to each wheel path independently.

(3) The pavement surface will be evaluated for the presence of rutting on each driving lane throughout the warranty period. The pavement surface will be measured beginning at the POB and every 40 m thereafter to determine the average rut depth to quantify rutting for a particular 160 m segment.

Rut measurements will be done using a straight, rigid device that is a minimum of 2 m long and of sufficient stiffness that it will not deflect from its own weight, or a wire under sufficient tension to prevent sag when extended 2 m. Measurements will be taken by placing this "straightedge" across the pavement surface perpendicular to the direction of travel. The straightedge shall contact the surface on at least two bearing points with one located on either side of the rut. The straightedge is properly located when sliding the straightedge along its axis does not change the location of the contact points. Rut depth is then measured at the point of greatest perpendicular distance from the bottom of the straightedge to the pavement surface.

(4) Segments that fall within "excluded areas", originally identified in the initial ride quality measurement plan, will be exempt from the warranty requirements.

82053-57994

A8. Corrective Actions.- The following corrective actions are recommended to outline typical acceptable treatments for the various condition parameters. The Department will accept the listed corrective action if the action addresses the cause of the condition parameter. The Contractor may use an alternative action subject to Department approval.

CONDITION PARAMETER (2)	RECOMMENDED ACTION
Transverse Cracking	Cut and Seal (3)
Longitudinal Cracking	Cut and Seal (3)
De-bonding	Mill and Resurface affected courses
Raveling	Mill and Resurface affected courses
Flushing	Mill and Resurface top course
Rutting	Microsurface or Mill and Resurface (1)

(1) Recommended action is dependent on the depth of the rut susceptible material.

(2) Any areas exhibiting Alligator or Block Cracking shall be removed and replaced as directed by the Engineer.

(3) Cut and seal is only a recommended action when cracking is in the top course only. Cracking that exists in the underlying leveling and/or base courses will require a different corrective action such as remove and replace to address the underlying cracking.

MICHIGAN DEPARTMENT OF TRANSPORTATION

INITIAL ACCEPTANCE
FOR
PAVEMENT WARRANTY

CONTRACT ID: ______________________________

CONTRACT SECTION: ____________________ **JOB NUMBER:** ____________________

SURETY NAME: ______________________________

SURETY ADDRESS: ______________________________

CONTRACTOR NAME: ______________________________

CONTRACTOR ADDRESS: ______________________________

IDENTIFY EACH JOB NUMBER, LOCATION AND WORK SEPARATELY

JOB NUMBER	ROUTE NUMBER	CONTROL SECTION	WORK TYPE	DATE ACCEPTED	PROJECT ENGINEER

INITIAL ACCEPTANCE OF WARRANTY WORK APPROVAL

CONTRACTOR'S SIGNATURE: ______________________________

ENGINEER'S SIGNATURE: ______________________________

ACCEPTANCE DATE: ____________________

cc: Surety Company, Financial Services - Payments

Item # _

MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

WARRANTY BOND

Bond Number ______________________

KNOWN ALL MEN BY THESE PRESENTS:

That we,_ (hereinafter called the "Principal"), and ____, a corporation duly organized under the laws of the State of ________________________ and duly licensed to transact business in the State of Michigan (hereinafter called "Surety"), are held and firmly bound unto the Michigan Department of Transportation (hereinafter called the "Obligee"), in the sum of ___******___ Dollars ($), for the payment of which sum well and truly to be made, we, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns , jointly and severally, firmly by these presents.

WHEREAS, the said Principal has heretofore entered into a contract with the Michigan Department of Transportation dated ___________________________ under Contract ID ___and;

WHEREAS, the said Principal is required to guarantee the ___ installed under said contract, against defects in materials or workmanship which may develop during the period(s) of ___ years beginning the date(s) of the Acceptance Date of Construction by the Obligee.

In no event shall losses paid under this bond aggregate more than the amount of the bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal shall faithfully carry out and perform the said guarantee, and shall, on due notice, repair and make good at its own expense any and all defects in materials or workmanship in the said work which may develop during the period specified above or shall pay over, make good and reimburse to the said Obligee all loss and damage which said Obligee may sustain by reason of failure or default of said Principal so to do, then this obligation shall be null and void; otherwise shall remain in full force and effect.

PROVIDED HOWEVER, that in the event of any default on the part of said Principal, a written statement of the particular facts showing such default and the date thereof shall be delivered to the Surety by registered mail, promptly in any event within ten (10) days after the Obligee or his representative shall learn of such default and that no claim, suit or action by reason of any default of the Principal shall be brought hereunder after the expiration of thirty (30) days from the end of the warranty period as herein set forth.

Signed this _______ day of ____________________, ______.

Contractor ______________________________________
a Corporation

By ______________________________________

Surety ______________________________________

By ______________________________________
Attorney-In-Fact

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PAVEMENT ACCEPTANCE FOR
BITUMINOUS MIXTURES WITH WARRANTY

a. Description.- This specification defines the requirements for pavement acceptance that: 1) are in addition to those specified in Section 502 of the 1996 Standard Specifications for Construction and 2) stipulate the condition when initial acceptance of the pavement can occur according to the Performance Warranty.

b. Definitions.- For purposes of this special provision, the following definitions will apply:

Broken Aggregate - Visually cracked aggregate resulting from excessive compaction effort.

Crack - A visible fissure of varying length and orientation in the bituminous that occurs partially or completely through one or more courses.

Flushing - A shiny or reflective condition that appears on the bituminous surface when asphalt binder collects in the voids that can be tacky, when touched, at high pavement temperatures.

Pavement - The completed bituminous courses including all driving lanes and shoulders.

Pavement Edge - The extremity boundaries of the pavement.

Rutting - A depression or displacement of the bituminous surface that occurs either in a longitudinal direction or over a localized area.

Segregation - A bituminous surface that exhibits a non-uniform distribution of coarse or fine aggregate in the mixture.

Roller Cracking -High density surface map-cracking that appears immediately after rolling.

c. Acceptance Criteria.- The Department will inspect the base and leveling courses within twelve hours of placement or prior to placement of a subsequent course whichever occurs sooner. Inspection of the top course will occur within twenty-four hours of placement. The pavement will be accepted within these time frames unless corrective action is required. In the event that corrective action is necessary, pavement acceptance will only occur after the Contractor has taken corrective action and the Engineer has determined that the pavement is in conformance with the contract plans and specifications.

d. Corrective Action.- Appropriate corrective action, as described in Table 1, may consist of: 1) remedial treatment such as crack or surface sealing or 2) replacement in kind. A contract payment adjustment of up to one hundred percent of the bid price may also be considered for corrective action if mutually agreed to by the Engineer and the Contractor. The Engineer may consult with department technical staff in the Construction & Technology Division to implement the corrective actions described in Table 1.

Table 1

Acceptance Factors (a)	Length	Extent (b)	Severity	Corrective Action (c)
Segregation	n/a	>20m2/100m LL	High (d)	Replace
Rutting	n/a	>10m long	> 6 mm average depth over the length of occurrence	Replace
Broken Aggregate	n/a	>20m2/100m LL	> 100 stones/m2	Not eligible for density incentive
Flushing	n/a	>10m2/100m LL	high (e)	Replace
Edge of Paved Shoulder	> 10m	visible ledges	> 75mm	Trim
Crack (f)	any	any	all	Seal (g)

Notes:
n/a = not applicable
LL = lane length
(a) = Acceptance factors apply to all courses except for Broken Aggregate and Flushing which apply to the top course only.
(b) = Extent is calculated by summing all locations within the length specified.
(c) = The appropriate corrective action is dependent on the factor's extent and severity and most importantly on the pavement's intended service life.
(d) = Segregation severity will be determined using department procedures that include photographs.
(e) = Flushing must be severe enough to significantly effect surface friction (Friction Number < 35).
(f) = Roller cracking is not subject to corrective action.
(g) = Other corrective action may be required as crack frequency increases.

e. Measurement and Payment- All costs for the work required to repair or replace any defects in construction quality, when caused by the contractor, are the responsibility of the Contractor. No time extensions will be granted to the Contractor for any required repair work to meet the requirements of this special provision. Any incentive payments will only apply to original work item quantities. Quantities required for corrective action will not be eligible for incentive payments.

Nuclear Gauge Data

US-24 Perpetual Pavement Demo Project
Control Section 83053 Job Number 57994
Average Dry Density and % Compaction per Soil Layer

	Site 1								Site 2							
	Lane 1		Lane 2		Lane 3		Lane 4		Lane 1		Lane 2		Lane 3		Lane 4	
Statistical Analysis	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction	Dry Density	Com-paction
	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%	lb/ft^3	%
	Clay Subgrade								Sand Subgrade							
Average	**106.353**	**94.6**	**113.116**	**100.9**	NA	NA	NA	NA	**110.14**	**101.2**	**107.996**	**99.3**	NA	NA	NA	NA
Stdev.	6.49682	7.2	5.57961	7.9	NA	NA	NA	NA	2.52812	2.3	2.75905	2.5	NA	NA	NA	NA
Max..	115.341	105.8	119.557	109.7	NA	NA	NA	NA	112.923	103.8	110.711	101.7	NA	NA	NA	NA
Min.	94.7153	81.6	102.486	88.3	NA	NA	NA	NA	107.053	98.4	104.47	96.0	NA	NA	NA	NA
C. of V.	6%	8%	5%	8%	NA	NA	NA	NA	2%	2%	3%	3%	NA	NA	NA	NA
	Sand Subbase								Sand Subbase							
Average	**128.585**	**93.5**	**128.797**	**93.6**	NA	NA	NA	NA	**131.091**	**98.3**	**134.804**	**101.1**	NA	NA	NA	NA
Stdev.	2.88034	2.1	1.74461	1.3	NA	NA	NA	NA	1.58538	1.2	1.60691	1.2	NA	NA	NA	NA
Max.	132.143	96.1	131.399	95.5	NA	NA	NA	NA	133.631	100.2	137.289	102.9	NA	NA	NA	NA
Min.	125.178	91.0	125.922	91.5	NA	NA	NA	NA	128.257	96.2	132.949	99.7	NA	NA	NA	NA
C. of V.	2%	2%	1%	1%	NA	NA	NA	NA	1%	1%	1%	1%	NA	NA	NA	NA
	Aggregate Base								Aggregate Base							
Average	**125.157**	**95.4**	**125.922**	**96.0**	**120.099**	**95.5**	**123.842**	**98.5**	**124.873**	**95.2**	**126.395**	**96.4**	**112.543**	**90.2**	**121.143**	**97.1**
Stdev.	2.08744	1.6	3.18361	2.4	4.61805	3.8	4.15754	3.3	5.32416	4.1	4.23406	3.2	15.7274	12.1	3.11349	2.4
Max.	128.464	98.0	129.208	98.5	127.906	101.9	127.947	102.1	132.804	101.3	131.605	100.4	123.959	99.5	124.765	100.7
Min.	122.843	93.7	120.321	91.8	113.687	90.1	115.527	92.1	116.973	89.2	119.743	91.3	75.3713	61.6	114.638	93.0
C. of V.	2%	2%	3%	3%	4%	4%	3%	3%	4%	4%	3%	3%	14%	13%	3%	2%

Control Section 83053 Job Number 57794 US-24 NB
Perpetual Pavement Project
Bituminous Layer Per Cent of Compaction

Date	Site	Lane	Layer	Average Compaction %	Stdev.	Max. %	Min. %	C. of V. %	Remarks
8/21/02	1	1	2E10	**88.1**	2.1	91.1	84.9	2	Segregated
10/12/02	1	1	3E10	**93.3**	1.9	98.2	90.3	2	
11/27/02	1	1	4E10	**93.7**	1.4	96.5	90.9	1	
8/21/02	1	2	2E10*	**94**	4	99.5	84.6	4	*Segregated-to be removed
10/12/02	1	2	2E10	**95.1**	2.1	100.6	92.9	2	3" milled off and 3" replaced
10/13/02	1	2	3E10	**90.7**	1.5	93.2	88.1	2	
11/27/02	1	2	4E10	**93.6**	1.4	95.7	90.8	1	
	1	3	2E10						No tests taken
11/9/02	1	3	3E10	**92.7**	1.8	95.7	87.5	2	
11/24/02	1	3	4E10	**93.9**	2	96.7	88.9	2	
11/11/02	1	4	2E10	**92.9**	2.1	95.9	88.9	2	Some segregation
11/11/02	1	4	3E10	**92**	1.6	95.2	89.2	2	
11/24/02	1	4	4E10	**95.1**	1.4	98.1	91.4	1	
8/26/02	2	1	2E10*	**95.8**	1.8	98.6	91.6	2	*Segregated-to be removed
10/12/02	2	1	2E10	**95.3**	1.9	98.9	92.1	2	3" milled off and 3" replaced
10/12/02	2	1	3E10	**90.3**	1.6	92.4	86.1	2	
11/27/02	2	1	4E10	**94.5**	0.7	96	93.1	1	
8/26/02	2	2	2E10*	**91.2**	1.5	93.7	87.9	2	*Segregated-to be removed
10/12/02	2	2	2E10	**94.4**	2.3	98.6	91.7	2	3" milled off and 3" replaced
10/13/02	2	2	3E10	**91.1**	0.8	92.5	89	1	
11/27/02	2	2	4E10	**93.4**	1.9	96.7	90	2	
	2	3	2E10						No tests taken
11/11/02	2	3	3E10	**93**	2.3	96.6	87	2	
11/26/02	2	3	4E10	**93.9**	1.9	96.3	89.5	2	
11/11/02	2	4	2E10	**93.2**	1.2	95.6	90.9	1	Some segregation
11/11/02	2	4	3E10	**92.2**	1.6	95.1	90.6	2	
11/24/02	2	4	4E10	**94.8**	2	97.2	86.9	2	

Test Date	Layer Material	Test Surface	Test Site	Test Point	Station m	Lane	Nuclear Density Gauge Data: Density Counts DC	Test Depth mm	Wet Density kg/m^3	Moist. Counts MC	Moist. kg/m3	Moist. %	Dry Density kg/m^3	Max. Density kg/m^3	Compaction %	Gauge No.: 104484 Operating Standard: Density Count	Moisture Count	Average GeoGauge: Soil Stiffness MN/m	Youngs Modulus MPa	Remarks
7/9/02	Clay	Subgrade	1	mid	29+900	1	2078	200	1865	256	329	21.4	1528	1872	81.6	2655	709	9.39	77.98	
7/11/02	Clay	Subgrade	1	mid	29+920	1	1697	200	1999	211	269	15.8	1725	1872	92.2	2661	705	4.33	35.96	Retest due to additional 300-350 mm undercut
7/11/02	Clay	Subgrade	1	mid	29+940	1	1725	200	1988	218	279	16.3	1708	1872	91.1	2661	705	5.41	44.91	Retest due to additional 300-350 mm undercut
7/11/02	Sand Clay	Subgrade	1	mid	29+960	1	1694	200	2004	149	184	10.1	1817	1872	97.0	2661	705	4.46	37.07	Retest due to additional 300-350 mm undercut
7/9/02	Sand	Subgrade	1	mid	29+980	1	2043	200	1886	113	134	7.5	1757	1758	99.9	2655	709	8.44	71.78	
7/9/02	Clay	Subgrade	1	mid	30+000	1	1531	200	2065	170	212	11.4	1980	1758	105.8	2655	709	17.89	148.54	
7/9/02	Clay	Subgrade	1	mid	30+020	1	1747	200	1979	213	271	15.8	1708	1758	97.1	2655	709	20.33	168.86	
7/9/02	Clay	Subgrade	1	mid	30+040	1	2013	200	1889	207	262	16.1	1624	1758	92.3	2655	709	15.88	131.85	
													1715.38		94.64			10.77	89.62	
													104.79		7.15			6.39	52.95	
													1860.33		105.80			20.33	168.86	
													1527.87		81.60			4.33	35.96	
													0		0			1	1	
7/9/02	Clay	Subgrade	1	mid	29+900	2	1642	200	2021	171	213	11.8	1812	1872	97.0	2655	709	11.01	91.40	
7/12/02	Clay	Subgrade	1	mid	29+920	2	1536	200	2060	253	332	19.2	1738	1872	92.7	2667	695	10.56	87.68	Retest due to additional 300-350 mm undercut
7/12/02	Clay	Subgrade	1	mid	29+940	2	1752	200	1977	244	320	19.3	1653	1872	88.3	2667	695	5.37	44.61	Retest due to additional 300-350 mm undercut
7/12/02	Sand/Clay	Subgrade	1	mid	29+960	2	1616	200	2034	152	191	10.4	1642	1872	98.4	2667	695	9.30	77.21	Retest due to additional 300-350 mm undercut
7/9/02	Clay	Subgrade	1	mid	29+980	2	1380	200	2129	188	238	12.5	1891	1758	108.5	2655	709	18.39	152.75	
7/9/02	Sand	Subgrade	1	mid	30+000	2	1498	200	2081	128	153	7.9	1928	1758	109.7	2655	709	22.60	187.68	
7/9/02	Sand	Subgrade	1	mid	30+020	2	1482	200	2084	186	234	12.6	1857	1758	105.6	2655	709	12.25	101.71	
7/9/02	Clay	Subgrade	1	mid	30+040	2	1484	200	2085	184	204	10.8	1876	1758	106.7	2655	709	15.89	131.96	
													1824.46		100.86			13.17	109.36	
													89.99		7.92			5.50	45.66	
													1928.33		109.70			22.60	187.68	
													1653.00		88.30			5.37	44.61	
													0		0			0	0	
10/21/02	Clay	Subgrade	1	mid	29+960	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.22	43.37	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	29+980	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.42	44.95	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+000	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.43	45.09	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+020	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.00	35.44	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+040	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.74	55.99	No Nuclear Density measurements taken
																		5.36	44.97	
																		0.97	7.33	
																		6.74	55.99	
																		4.00	35.44	
																		0	0	
10/21/02	Clay	Subgrade	1	mid	29+960	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.60	46.52	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	29+980	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.36	36.23	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+000	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.32	19.29	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+020	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.30	35.68	No Nuclear Density measurements taken
10/21/02	Clay	Subgrade	1	mid	30+040	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.77	31.28	No Nuclear Density measurements taken
																		4.07	33.80	
																		1.19	9.85	
																		5.60	46.52	
																		2.32	19.29	
																		0	0	
7/19/02	Sand	Subbase	1	mid	29+900	1	1393	200	2135	96	112	5.5	2019	2219	91.0	2683	703	11.72	97.26	
7/19/02	Sand	Subbase	1	mid	29+920	1	1381	200	2141	92	108	5.2	2028	2219	91.4	2683	703	10.12	84.08	
7/19/02	Sand	Subbase	1	mid	29+940	1	1202	200	2226	102	120	5.7	2106	2219	94.9	2683	703	7.79	64.65	
7/19/02	Sand	Subbase	1	mid	29+960	1	1274	200	2190	104	123	5.9	2066	2219	93.2	2683	703	6.63	55.04	
7/19/02	Sand	Subbase	1	mid	29+980	1	1364	200	2146	101	119	5.8	2024	2219	91.3	2683	703	8.21	68.18	
7/19/02	Sand	Subbase	1	mid	30+000	1	1207	200	2223	113	135	6.5	2087	2219	94.0	2683	703	8.28	68.71	
7/19/02	Sand	Subbase	1	mid	30+020	1	NA	200	2244	NA	110	5.2	2131	2219	96.1	2683	703	7.00	58.11	
7/19/02	Sand	Subbase	1	mid	30+040	1	1138	200	2259	106	126	5.9	2129	2219	95.9	2683	703	7.56	62.75	
													2074		93.5			8.41	69.85	
													46		2.1			1.70	14.10	
													2131		96.1			11.72	97.26	
													2019		91.0			6.63	55.04	
													0		0			0	0	
7/19/02	Sand	Subbase	1	mid	29+900	2	1278	200	2189	99	116	5.6	2075	2219	93.5	2683	703	16.25	135.16	
7/19/02	Sand	Subbase	1	mid	29+920	2	1194	200	2230	102	120	5.7	2110	2219	95.1	2683	703	7.43	61.73	
7/19/02	Sand	Subbase	1	mid	29+940	2	1364	200	2148	99	116	5.7	2031	2219	91.5	2683	703	9.93	82.43	
7/19/02	Sand	Subbase	1	mid	29+960	2	1195	200	2251	103	121	5.7	2119	2219	95.5	2683	703	7.54	62.84	
7/19/02	Sand	Subbase	1	mid	29+980	2	1296	200	2180	94	109	5.3	2063	2219	93.0	2683	703	6.47	53.67	
7/19/02	Sand	Subbase	1	mid	30+000	2	1232	200	2211	101	119	5.7	2087	2219	94.1	2683	703	6.64	55.17	
7/19/02	Sand	Subbase	1	mid	30+020	2	1291	200	2183	96	112	5.4	2064	2219	92.7	2683	703	9.39	78.01	

Test Date	Layer Material	Test Surface	Test Site	Test Point	Station m	Lane	Density Counts DC	Test Depth mm	Wet Density kg/m^3	Moist. Counts MC	Moist. kg/m3	Moist. %	Dry Density kg/m^3	Max. Density kg/m^3	Compaction %	Operating Standard Density Count	Operating Standard Moisture Count	Soil Stiffness MN/m	Youngs Modulus MPa	Remarks
							Nuclear Density Gauge Data									Gauge No.: 104484		GeoGauge		
7/19/02	Sand	Subbase	1	mid	30+040	2	1270	200	2192	100	117	5.7	2069	2219	93.2	2683	703	6.98	74.58	
													2077		93.8			9.08	75.43	
													28		1.3			3.16	26.35	
													2119		95.5			16.25	135.18	
													2031		91.5			6.47	53.67	
													0		0			0	0	
10/24/02	Sand	Subbase	1	mid	29+900	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.08	67.07	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+920	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.98	57.97	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+940	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.75	47.77	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+960	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.13	67.52	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+980	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.00	41.50	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+000	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.64	55.16	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+020	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.95	66.05	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+040	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.28	68.57	No Nuclear Density measurements taken
																		7.10	58.95	
																		1.23	10.19	
																		8.28	68.57	
																		5.00	41.50	
																		0	0	
10/24/02	Sand	Subbase	1	mid	29+900	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.25	60.17	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+920	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.33	60.91	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+940	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.35	61.03	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+960	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.65	79.97	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	29+980	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.46	61.93	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+000	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.21	68.22	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+020	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.86	73.58	No Nuclear Density measurements taken
10/24/02	Sand	Subbase	1	mid	30+040	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.82	84.94	No Nuclear Density measurements taken
																		7.99	66.35	
																		0.87	7.16	
																		9.65	79.97	
																		7.25	60.17	
																		0	0	
8/12/02	Aggregate	Base	1	mid	29+900	1	1550	200	2068	72	79	4.0	1989	2115	94.0	2672	698	8.21	68.06	
8/12/02	Aggregate	Base	1	mid	29+920	1	1459	200	2105	77	86	4.3	2042	2115	96.5	2672	698	6.18	73.35	
8/12/02	Aggregate	Base	1	mid	29+940	1	1477	200	2098	75	84	4.2	2015	2115	95.3	2672	698	8.38	69.49	
8/12/02	Aggregate	Base	1	mid	29+960	1	1367	200	2146	72	79	3.8	2072	2115	98.0	2672	698	9.04	75.07	
8/12/02	Aggregate	Base	1	mid	29+980	1	1543	200	2071	72	79	4.0	1984	2115	93.8	2672	698	10.17	84.40	
8/12/02	Aggregate	Base	1	mid	30+000	1	1397	200	2133	74	82	4.0	2051	2115	97.0	2672	698	9.75	80.94	
8/12/02	Aggregate	Base	1	mid	30+020	1	1451	200	2109	79	89	4.4	2018	2115	95.3	2672	698	8.30	68.93	
8/12/02	Aggregate	Base	1	mid	30+040	1	1587	200	2053	68	74	3.7	1981	2115	93.7	2672	698	8.59	78.85	
													2019		95.4			8.58	74.64	
													34		1.6			1.21	5.91	
													2072		98.0			10.17	84.40	
													1981		93.7			6.18	68.06	
													0		0			0	0	
8/12/02	Aggregate	Base	1	mid	29+900	2	1340	200	2158	78	88	4.2	2072	2115	98.0	2672	698	9.82	81.54	GeoGauge:Fines at surface
8/12/02	Aggregate	Base	1	mid	29+920	2	1423	200	2121	78	88	4.3	2034	2115	96.2	2672	698	10.50	87.36	GeoGauge:Fines at surface
8/12/02	Aggregate	Base	1	mid	29+940	2	1473	200	2099	77	86	4.3	2023	2115	95.7	2672	698	9.55	79.35	
8/12/02	Aggregate	Base	1	mid	29+960	2	1287	200	2183	87	100	4.8	2084	2115	98.5	2672	698	10.26	85.24	
8/12/02	Aggregate	Base	1	mid	29+980	2	1582	200	2055	76	85	4.3	1975	2115	93.4	2672	698	8.31	69.02	
8/12/02	Aggregate	Base	1	mid	30+000	2	1332	200	2162	70	77	3.7	2082	2115	98.5	2672	698	9.43	78.29	GeoGauge:Fines at surface
8/12/02	Aggregate	Base	1	mid	30+020	2	1663	200	2023	76	85	4.4	1941	2115	91.8	2672	698	7.65	65.19	
8/12/02	Aggregate	Base	1	mid	30+040	2	1464	200	2129	84	96	4.7	2037	2115	96.3	2672	698	7.64	63.42	
													2031		96.0			9.17	76.18	
													51		2.4			1.10	9.14	
													2084		98.5			10.50	87.36	
													1941		91.8			7.64	63.42	
													0		0			0	0	
10/30/02	Aggregate	Base	1	mid	29+900	3	1492	200	2087	95	111	5.8	1983	2140	97.6	2659	700	9.83	80.01	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+920	3	1591	200	2048	83	94	4.8	1953	2140	95.7	2659	700	7.25	80.49	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+930*	3	1448	200	2106	98	115	5.8	2000	2140	98.7	2659	700	NA	NA	*wrong test point, not rolled to density
10/30/02	Aggregate	Base	1	mid	29+940	3	1698	200	2006	86	99	5.2	1898	2140	93.6	2659	700	6.59	54.75	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+960	3	1277	200	2183	104	123	6.0	2063	2140	101.9	2659	700	11.93	99.09	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+980	3	1518	200	2077	93	108	5.5	1973	2140	97.1	2659	700	8.21	68.18	Not rolled to density
10/30/02	Aggregate	Base	1	mid	30+000	3	1780	200	1977	884	96	5.1	1875	2140	92.2	2659	700	7.00	58.10	Not rolled to density

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data: Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Com-paction
10/12/02	2E10	Base	1	owp	29+900	2	737	BS	2341	107	95	4.2	2246	2513	93.1
10/12/02	2E10	Base	1	mid	29+900	2	736	BS	2336	102	88	3.9	2248	2513	92.9
10/12/02	2E10	Base	1	iwp	29+920	2	715	BS	2366	114	101	4.5	2265	2513	94.2
10/12/02	2E10	Base	1	owp	29+920	2	717	BS	2363	120	107	4.8	2256	2513	94.0
10/12/02	2E10	Base	1	mid	29+920	2	713	BS	2369	125	112	5.0	2257	2513	94.3
10/12/02	2E10	Base	1	iwp	29+940	2	722	BS	2357	112	99	4.4	2257	2513	93.8
10/12/02	2E10	Base	1	owp	29+940	2	731	BS	2342	112	99	4.4	2243	2513	93.2
10/12/02	2E10	Base	1	mid	29+940	2	727	BS	2349	120	107	4.8	2241	2513	93.5
10/12/02	2E10	Base	1	iwp	29+960	2	720	BS	2358	120	147	6.7	2211	2513	93.8
10/12/02	2E10	Base	1	owp	29+960	2	731	BS	2342	121	149	6.8	2193	2513	93.2
10/12/02	2E10	Base	1	mid	29+960	2	723	BS	2353	121	149	6.8	2204	2513	93.6
10/12/02	2E10	Base	1	iwp	29+980	2	732	BS	2341	111	135	6.1	2206	2513	93.1
10/12/02	2E10	Base	1	owp	29+980	2	721	BS	2357	114	139	6.3	2217	2513	93.8
10/12/02	2E10	Base	1	mid	29+980	2	716	BS	2365	111	135	6.0	2230	2513	94.1
10/12/02	2E10	Base	1	iwp	30+000	2	694	BS	2398	117	144	6.4	2254	2513	95.4
10/12/02	2E10	Base	1	owp	30+000	2	695	BS	2397	115	141	6.3	2256	2513	95.4
10/12/02	2E10	Base	1	mid	30+000	2	677	BS	2425	118	144	6.3	2281	2513	96.5
10/12/02	2E10	Base	1	iwp	30+020	2	684	BS	2414	117	144	6.4	2270	2513	96.1
10/12/02	2E10	Base	1	owp	30+020	2	673	BS	2433	116	143	6.2	2291	2513	96.8
10/12/02	2E10	Base	1	mid	30+020	2	671	BS	2528	118	144	6.0	2384	2513	100.6
10/12/02	2E10	Base	1	iwp	30+040	2	651	BS	2469	119	146	6.3	2323	2513	98.2
10/12/02	2E10	Base	1	owp	30+040	2	641	BS	2486	123	152	6.5	2334	2513	98.9
10/12/02	2E10	Base	1	mid	30+040	2	657	BS	2457	125	155	6.8	2302	2513	97.8
11/11/02	2E10	Base	1	owp	29+900	4	732	BS	2350	110	130	5.8	2220	2513	93.5
11/11/02	2E10	Base	1	mid	29+900	4	746	BS	2329	109	128	5.8	2201	2513	92.7
11/11/02	2E10	Base	1	iwp	29+900	4	708	BS	2386	105	123	5.4	2263	2513	94.9
11/11/02	2E10	Base	1	owp	29+920	4	766	BS	2301	106	124	5.7	2177	2513	91.6
11/11/02	2E10	Base	1	mid	29+920	4	760	BS	2309	110	130	6	2179	2513	91.9
11/11/02	2E10	Base	1	iwp	29+920	4	729	BS	2354	114	135	6.1	2219	2513	93.7
11/11/02	2E10	Base	1	owp	29+940	4	775	BS	2288	119	142	6.6	2146	2513	91.0
11/11/02	2E10	Base	1	mid	29+940	4	700	BS	2398	106	124	5.5	2274	2513	95.4
11/11/02	2E10	Base	1	iwp	29+940	4	725	BS	2360	108	127	5.7	2233	2513	93.9
11/11/02	2E10	Base	1	owp	29+960	4	743	BS	2334	110	130	5.9	2204	2513	92.9
11/11/02	2E10	Base	1	mid	29+960	4	710	BS	2383	111	131	5.8	2252	2513	94.8
11/11/02	2E10	Base	1	iwp	29+960	4	768	BS	2398	113	133	6.2	2265	2513	95.4
11/11/02	2E10	Base	1	owp	29+980	4	751	BS	2322	112	133	6.1	2189	2513	92.4
11/11/02	2E10	Base	1	mid	29+980	4	793	BS	2263	124	149	7	2114	2513	90.1
11/11/02	2E10	Base	1	iwp	29+980	4	806	BS	2247	110	141	6.7	2106	2513	89.4
11/11/02	2E10	Base	1	owp	30+000	4	787	BS	2272	119	142	6.7	2130	2513	90.4
11/11/02	2E10	Base	1	mid	30+000	4	703	BS	2393	111	131	5.8	2262	2513	95.2
11/11/02	2E10	Base	1	iwp	30+000	4	815	BS	2235	116	130	6.6	2105	2513	88.9
11/11/02	2E10	Base	1	owp	30+020	4	752	BS	2323	113	134	6.1	2189	2513	92.4

							Nuclear Density Gauge Data									Gauge No.: 104484		GeoGauge		
																Operating Standard				
Test Date	Layer Material	Test Surface	Test Site	Test Point	Station m	Lane	Density Counts DC	Test Depth mm	Wet Density kg/m^3	Moist. Counts MC	Moist. kg/m3	Moist. %	Dry Density kg/m^3	Max. Density kg/m^3	Compaction %	Density Count	Moisture Count	Soil Stiffness MN/m	Youngs Modulus MPa	Remarks
10/26/02	Sand	Subbase	2	mid	31+000	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.93	65.86	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+020	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.70	63.93	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+040	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.39	61.34	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+060	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.00	66.41	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+080	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.96	66.10	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+100	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.24	60.09	No Nuclear Density measurements taken
																		7.66	63.38	
																		0.34	2.72	
																		8.00	66.41	
																		7.19	59.67	
																		0	0	
8/8/02	Aggregate	Base	2	mid	30+960	1	1888	200	1946	59	61	3.2	1887	2115	89.2	2635	707	7.57	62.89	
8/8/02	Aggregate	Base	2	mid	30+980	1	1627	200	2041	69	72	3.8	1967	2115	93.0	2635	707	7.98	66.29	
8/8/02	Aggregate	Base	2	mid	31+000	1	1709	200	2010	62	65	3.3	1945	2115	92.0	2635	707	7.30	60.63	
8/8/02	Aggregate	Base	2	mid	31+020	1	1631	200	2040	68	72	3.7	1967	2115	93.0	2635	707	7.96	66.22	
8/8/02	Aggregate	Base	2	mid	31+040	1	1384	200	2142	74	80	3.9	2061	2115	97.5	2635	707	9.69	80.44	
8/8/02	Aggregate	Base	2	mid	31+060	1	1379	200	2144	72	78	3.8	2049	2115	96.9	2635	707	9.21	76.46	
8/8/02	Aggregate	Base	2	mid	31+080	1	1198	200	2231	80	89	4.2	2142	2115	101.3	2635	707	12.47	103.60	GeoGauge:Fines at surface
8/8/02	Aggregate	Base	2	mid	31+100	1	1319	200	2172	72	78	3.7	2094	2115	99.0	2635	707	11.59	96.21	GeoGauge:Fines at surface
													2014		95.2			9.22	76.59	
													88		4.1			1.92	15.97	
													2142		101.3			12.47	103.80	
													1887		89.2			7.30	60.63	
													0		0			0	0	
8/8/02	Aggregate	Base	2	mid	30+960	2	1620	200	2044	66	69	3.5	1974	2115	93.3	2635	707	9.30	77.23	
8/8/02	Aggregate	Base	2	mid	30+980	2	1396	200	2136	77	84	4.2	2051	2115	97.0	2635	707	10.86	90.21	GeoGauge:Fines at surface
8/8/02	Aggregate	Base	2	mid	31+000	2	1599	200	2052	66	70	3.5	1982	2115	93.7	2635	707	8.50	70.62	
8/8/02	Aggregate	Base	2	mid	31+020	2	1729	200	2003	67	72	3.7	1931	2115	91.3	2635	707	8.37	69.51	
8/8/02	Aggregate	Base	2	mid	31+040	2	1300	200	2181	78	85	4.0	2096	2115	99.1	2635	707	12.94	107.46	GeoGauge:Fines at surface
8/8/02	Aggregate	Base	2	mid	31+060	2	1227	200	2216	83	93	4.4	2123	2115	100.4	2635	707	13.72	113.94	GeoGauge:Fines at surface
8/8/02	Aggregate	Base	2	mid	31+080	2	1350	200	2157	84	94	4.6	2062	2115	97.5	2635	707	12.18	100.97	GeoGauge:Fines at surface
8/8/02	Aggregate	Base	2	mid	31+100	2	1303	200	2179	80	89	4.3	2090	2115	98.8	2635	707	13.59	112.84	GeoGauge:Fines at surface
													2039		96.4			11.18	92.85	
													68		3.2			2.24	18.57	
													2123		100.4			13.72	113.94	
													1931		91.3			8.37	69.51	
													0		0			0	0	
11/4/02	Aggregate	Base	2	mid	30+960	3	1404	200	2130	110	131	6.6	1999	2140	99.5	2667	706	10.11	83.94	Not rolled to density
11/4/02	Aggregate	Base	2	mid	30+980	3	1906	200	1937	113	134	7.4	1803	2140	90.5	2667	706	8.05	66.65	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+000	3	1484	200	2096	110	131	6.6	1965	2140	97.9	2667	706	11.01	91.40	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+020	3	1661	200	2018	92	107	5.6	1911	2140	94.3	2667	706	9.57	77.79	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+040	3	1636	200	2035	90	103	5.3	1933	2140	95.1	2667	706	8.32	69.14	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+060	3	1973	200	1318	89	102	5.6	1218	2140	61.6	2667	706	3.15	26.12	uncompacted agg. with no fines, not rolled to density
11/4/02	Aggregate	Base	2	mid	31+080	3	2087	200	1881	93	103	5.6	1779	2140	87.9	2667	706	4.98	41.37	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+100	3	1676	200	2020	91	104	5.4	1918	2140	94.4	2667	706	12.04	100.01	Not rolled to density
													1815		90.2			8.40	69.58	
													254		12.1			3.02	24.96	
													1999		99.5			12.04	100.01	
													1216		61.6			3.15	26.12	
													0		0			0	0	
11/4/02	Aggregate	Base	2	mid	30+960	4	1460	200	2098	112	133	6.6	1964	2140	98.0	2667	706	10.55	87.63	Not rolled to density
11/4/02	Aggregate	Base	2	mid	30+980	4	1346	200	2155	119	143	7.1	2012	2140	100.7	2667	706	11.95	99.25	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+000	4	1755	200	1990	117	141	7.6	1849	2140	93.0	2667	706	9.96	82.76	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+020	4	1461	200	2106	102	119	6.0	1987	2140	98.4	2667	706	9.24	76.72	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+040	4	1458	200	2108	101	118	6.0	1990	2140	98.5	2667	706	7.88	65.44	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+060	4	1589	200	2054	94	108	5.6	1946	2140	96.0	2667	706	8.99	74.68	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+080	4	1582	200	2065	95	110	5.6	1954	2140	96.5	2667	706	8.57	71.15	Not rolled to density
11/4/02	Aggregate	Base	2	mid	31+100	4	1624	200	2040	97	112	5.6	1928	2140	95.3	2667	706	9.94	82.56	Not rolled to density
													1954		97.1			9.84	80.02	
													50		2.4			1.27	10.50	
													2012		100.7			11.95	99.25	
													1849		93.0			7.88	65.44	
													0		0			0	0	

Test Date	Layer Material	Test Surface	Test Site	Test Point	Station m	Lane	Nuclear Density Gauge Data: Density Counts DC	Test Depth mm	Wet Density kg/m^3	Moist. Counts MC	Moist. kg/m3	Moist. %	Dry Density kg/m^3	Max. Density kg/m^3	Compaction	Gauge No.: 104484 Operating Standard: Density Count	Moisture Count	GeoGauge: Soil Stiffness MN/m	Youngs Modulus MPa	Remarks
10/23/02	Sand	Subgrade	2	mid	30+980	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.54	37.72	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+000	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.40	36.67	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+020	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.72	39.19	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+040	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.78	39.66	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+060	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.12	42.53	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+080	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.74	31.07	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+100	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.74	31.10	No Nuclear Density measurements taken
																		4.62	38.36	
																		0.71	5.87	
																		5.69	46.94	
																		3.74	31.07	
																		0	0	
10/23/02	Sand	Subgrade	2	mid	30+960	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.94	32.73	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	30+980	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.56	29.56	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+000	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.18	26.41	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+020	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.03	33.45	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+040	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.27	35.50	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+060	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.33	27.67	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+080	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.63	21.87	No Nuclear Density measurements taken
10/23/02	Sand	Subgrade	2	mid	31+100	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.75	31.13	No Nuclear Density measurements taken
																		3.59	29.79	
																		0.53	4.39	
																		4.27	35.50	
																		2.63	21.87	
																		0	0	
7/29/02	Sand	Subbase	2	mid	30+960	1	1137	200	2261	125	154	7.3	2107	2151	98.0	2694	696	4.01	33.29	gravel like material
7/29/02	Sand	Subbase	2	mid	30+980	1	1210	200	2223	125	154	7.4	2069	2151	96.2	2694	696	1.29	10.47	gravel like material
7/29/02	Sand	Subbase	2	mid	31+000	1	1072	200	2297	117	142	6.6	2155	2151	100.2	2694	696	5.02	41.70	gravel like material
7/29/02	Sand	Subbase	2	mid	31+020	1	1160	200	2251	109	131	6.2	2119	2151	98.5	2694	696	6.31	53.42	gravel like material
7/29/02	Sand	Subbase	2	mid	31+040	1	1117	200	2271	136	168	8.0	2103	2151	97.7	2694	696	2.34	19.45	gravel like material
7/29/02	Sand	Subbase	2	mid	31+060	1	1062	200	2299	135	167	7.8	2135	2151	99.2	2694	696	2.02	16.73	gravel like material
7/29/02	Sand	Subbase	2	mid	31+080	1	1108	200	2272	138	172	8.2	2104	2151	97.8	2694	696	2.50	20.76	gravel like material
7/29/02	Sand	Subbase	2	mid	31+100	1	1076	200	2293	137	169	8.0	2124	2151	98.7	2694	696	2.10	17.49	gravel like material
													2114		98.3			3.20	26.87	
													28		1.2			1.74	14.73	
													2155		100.2			6.31	53.42	
													2069		96.2			1.29	10.47	
													0		0			1	1	
7/29/02	Sand	Subbase	2	mid	30+960	2	987	200	2345	154	194	9.0	2150	2151	100.0	2694	696	1.43	11.90	gravel like material- very soft
7/29/02	Sand	Subbase	2	mid	30+980	2	939	200	2378	131	162	7.3	2214	2151	102.9	2694	696	4.19	34.79	gravel like material
7/29/02	Sand	Subbase	2	mid	31+000	2	1091	200	2287	110	133	6.2	2154	2151	100.1	2694	696	7.70	63.94	gravel like material
7/29/02	Sand	Subbase	2	mid	31+020	2	1097	200	2284	115	139	6.5	2144	2151	99.7	2694	696	4.02	33.47	gravel like material
7/29/02	Sand	Subbase	2	mid	31+040	2	1005	200	2337	109	132	5.9	2205	2151	102.5	2694	696	5.95	49.43	gravel like material
7/29/02	Sand	Subbase	2	mid	31+060	2	1063	200	2303	115	139	6.4	2164	2151	100.6	2694	696	7.00	54.80	gravel like material
7/29/02	Sand	Subbase	2	mid	31+080	2	989	200	2345	129	158	7.2	2186	2151	101.6	2694	696	1.69	14.06	gravel like material
7/29/02	Sand	Subbase	2	mid	31+100	2	999	200	2339	126	164	7.5	2175	2151	101.2	2694	696	2.76	22.93	gravel like material
													2174		101.1			4.34	35.67	
													26		1.2			2.38	19.10	
													2214		102.9			7.70	63.94	
													2144		99.7			1.43	11.90	
													0		0			1	1	
10/26/02	Sand	Subbase	2	mid	30+960	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.71	47.46	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	30+980	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.68	46.67	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+000	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.99	66.36	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+020	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.87	57.04	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+040	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.96	49.45	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+060	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.85	48.62	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+080	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.34	60.97	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	31+100	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.66	47.02	No Nuclear Density measurements taken
																		6.38	52.95	
																		0.90	7.53	
																		7.99	66.36	
																		5.66	46.67	
																		0	0	
10/26/02	Sand	Subbase	2	mid	30+960	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.66	63.84	No Nuclear Density measurements taken
10/26/02	Sand	Subbase	2	mid	30+980	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.19	59.67	No Nuclear Density measurements taken

Test Date	Layer Material	Test Surface	Test Site	Test Point	Station m	Lane	Nuclear Density Gauge Data: Density Counts DC	Test Depth mm	Wet Density kg/m^3	Moist. Counts MC	Moist. kg/m3	Moist. %	Dry Density kg/m^3	Max. Density kg/m^3	Compaction %	Gauge No.: 104484 Operating Standard: Density Count	Moisture Count	GeoGauge: Soil Stiffness MN/m	Youngs Modulus MPa	Remarks
10/30/02	Aggregate	Base	1	mid	30+020	3	1922	200	1928	87	100	5.5	1834	2140	90.1	2659	700	10.01	83.15	Not rolled to density
10/30/02	Aggregate	Base	1	mid	30+040	3	1853	200	2022	101	119	8.3	1900	2140	94.2	2659	700	9.68	80.26	Not rolled to density
													1937		95.5			8.66	72.00	
													74		3.8			1.95	16.15	
													2063		101.9			11.93	99.09	
													1834		90.1			8.59	54.75	
													0		0			0	0	
10/30/02	Aggregate	Base	1	mid	29+900	4	1390	200	2131	95	111	5.5	2027	2140	99.8	2659	700	11.35	94.23	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+920	4	1320	200	2164	88	101	4.9	2060	2140	101.1	2659	700	9.41	78.18	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+930*	4	1511	200	2079	96	112	5.7	1968	2140	97.2	2659	700	NA	NA	*wrong test point, not rolled to density
10/30/02	Aggregate	Base	1	mid	29+940	4	1381	200	2144	95	111	5.5	2024	2140	99.9	2659	700	10.00	83.04	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+960	4	1295	200	2175	104	123	8.0	2084	2140	102.1	2659	700	10.20	84.64	Not rolled to density
10/30/02	Aggregate	Base	1	mid	29+980	4	1380	200	2144	103	122	6.0	2030	2140	100.4	2659	700	9.17	78.15	Not rolled to density
10/30/02	Aggregate	Base	1	mid	30+000	4	1401	200	2126	95	111	5.5	2019	2140	99.4	2659	700	6.17	46.97	Not rolled to density
10/30/02	Aggregate	Base	1	mid	30+020	4	1997	200	1970	92	107	5.7	1863	2140	92.1	2659	700	8.07	67.02	Not rolled to density
10/30/02	Aggregate	Base	1	mid	30+040	4	1594	200	2048	83	94	4.8	1952	2140	95.6	2659	700	8.97	74.52	Not rolled to density
													1997		98.5			9.14	72.93	
													67		3.3			0.62	12.83	
													2064		102.1			10.20	84.64	
													1863		92.1			8.07	46.97	
													0		0			0	0	
7/11/02	Clay	Subgrade	2	mid	31+100	1	1614	200	2031	198	251	14.1	1780	1758	101.4	2661	705	7.48	62.26	
7/11/02	Sand	Subgrade	2	mid	31+120	1	1638	200	2023	182	229	12.8	1794	1758	102.1	2661	705	6.79	56.37	
7/11/02	Clay	Subgrade	2	mid	31+140	1	1719	200	1990	216	279	16.3	1712	1758	97.3	2661	705	1.97	16.40	
7/11/02	Sand	Subgrade	2	mid	31+115	1	1717	200	1993	186	235	13.4	1758	1758	100.0	2661	705	NA	NA	Extra test on soft punky subgrade
7/11/02	Clay	Subgrade	2	mid	31+180	1	1557	200	2053	216	276	15.5	1777	1758	101.1	2661	705	2.01	16.69	
7/11/02	Sand	Subgrade	2	mid	31+180	1	1652	200	2014	242	312	18.3	1701	1758	96.8	2661	705	0.80	6.63	
7/11/02	Sand	Subgrade	2	mid	31+200	1	1522	200	2066	229	294	16.6	1772	1758	100.8	2661	705	2.21	18.36	
7/11/02	Sand	Subgrade	2	mid	31+215	1	1644	200	2018	218	279	16.0	1740	1758	98.9	2661	705	1.36	11.28	
7/11/02	Sand	Subgrade	2	mid	31+239	1	1660	200	2011	241	310	18.3	1700	1758	96.7	2661	705	2.00	16.58	Very wet
7/12/02	Sand	Subgrade	2	mid	30+960	1	1644	200	2019	217	282	16.2	1738	1755	99.0	2667	695	5.92	49.16	
7/12/02	Sand	Subgrade	2	mid	30+980	1	2186	200	1847	96	113	8.5	1734	1755	98.8	2667	695	4.62	39.99	
7/12/02	Sand	Subgrade	2	mid	31+000	1	2309	200	1813	76	66	5.0	1727	1755	98.4	2667	695	4.42	36.66	
7/12/02	Sand	Subgrade	2	mid	31+020	1	2006	200	1903	61	93	5.1	1810	1755	103.3	2667	695	4.25	35.31	
7/12/02	Sand	Subgrade	2	mid	31+040	1	1794	200	1971	122	152	8.2	1821	1755	103.8	2667	695	5.69	47.26	
7/12/02	Sand Wet	Subgrade	2	mid	31+060	1	1742	200	1986	176	224	12.6	1761	1755	100.4	2667	695	3.77	31.34	1' undercut
7/12/02	Sand	Subgrade	2	mid	31+080	1	1588	200	2043	189	243	13.5	1801	1755	102.6	2667	695	3.95	32.79	
7/12/02	Sand	Subgrade	2	mid	31+100	1	1607	200	2037	170	217	11.9	1820	1755	103.7	2667	695	4.36	36.21	
													1776		101.2			4.65	38.59	
													41		2.3			0.78	6.49	
													1821		103.8			5.92	49.16	
													1727		98.4			3.77	31.34	
													0		0			0	0	
7/11/02	Sand	Subgrade	2	mid	31+100	2	1840	200	1951	148	182	10.3	1769	1758	100.8	2661	705	12.59	104.58	
7/11/02	Sand	Subgrade	2	mid	31+120	2	1803	200	1962	165	234	13.6	1728	1758	98.3	2661	705	6.36	52.85	
7/11/02	Sand	Subgrade	2	mid	31+140	2	1957	200	1913	149	184	10.6	1211	1758	98.3	2661	705	8.24	70.11	
7/11/02	Clay	Subgrade	2	mid	31+160	2	1572	200	2048	194	246	13.7	1802	1758	102.5	2661	705	5.40	44.82	
7/11/02	Sand	Subgrade	2	mid	31+180	2	1464	200	2091	215	276	15.2	1816	1758	103.3	2661	705	2.42	20.09	
7/11/02	Sand	Subgrade	2	mid	31+200	2	1583	200	2042	213	272	15.4	1771	1758	100.7	2661	705	4.22	35.08	
7/11/02	Sand	Subgrade	2	mid	31+215	2	1544	200	2057	202	256	14.3	1802	1758	102.5	2661	705	2.72	22.59	
7/11/02	Sand	Subgrade	2	mid	31+240	2	1623	200	2028	223	290	16.4	1740	1758	99.0	2661	705	1.90	15.80	Very wet
7/12/02	Sand	Subgrade	2	mid	30+960	2	1744	200	1984	188	210	11.8	1774	1755	101.1	2667	695	6.03	50.05	
7/12/02	Sand	Subgrade	2	mid	30+980	2	2326	200	1807	93	109	6.4	1698	1755	96.7	2667	695	4.23	35.13	
7/12/02	Sand	Subgrade	2	mid	31+000	2	1923	200	1927	117	144	8.0	1784	1755	101.7	2667	695	4.08	33.93	
7/12/02	Sand	Subgrade	2	mid	31+020	2	2056	200	1885	93	109	6.1	1777	1755	101.3	2667	695	5.17	42.92	
7/12/02	Sand	Subgrade	2	mid	31+040	2	2438	200	1778	78	88	5.2	1689	1755	96.3	2667	695	5.52	45.84	
7/12/02	Sand Wet	Subgrade	2	mid	31+060	2	1246	200	1966	216	281	16.6	1665	1755	98.0	2667	695	3.63	30.18	wet sand 3' undercut
7/12/02	Sand	Subgrade	2	mid	31+080	2	1840	200	1951	165	209	12.0	1742	1755	99.3	2667	695	5.64	46.94	
7/12/02	Sand	Subgrade	2	mid	31+100	2	1656	200	1948	131	162	9.1	1786	1755	101.7	2667	695	5.01	41.62	
													1742		99.3			4.91	40.83	
													45		2.5			0.85	7.03	
													1786		101.7			6.03	50.05	
													1665		96.0			3.63	30.18	
													0		0			0	0	
10/23/02	Sand	Subgrade	2	mid	30+960	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.69	48.94	No Nuclear Density measurements taken

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Com-paction
11/11/02	2E10	Base	1	mid	30+020	4	712	BS	2379	111	131	5.8	2248	2513	94.7
11/11/02	2E10	Base	1	iwp	30+020	4	693	BS	2409	107	126	5.5	2283	2513	95.9
11/11/02	2E10	Base	1	owp	30+040	4	764	BS	2304	114	136	6.2	2168	2513	91.7
11/11/02	2E10	Base	1	mid	30+040	4	698	BS	2401	114	135	6	2266	2513	95.5
11/11/02	2E10	Base	1	iwp	30+040	4	761	BS	2308	105	123	5.6	2185	2513	91.8
															94.0
															2.3
															100.6
															88.9
															2%
10/12/02	3E10	Leveling	1	iwp	29+900	1	748	BS	2318	114	139	6.4	2179	2510	92.4
10/12/02	3E10	Leveling	1	mid	29+900	1	785	BS	2267	110	133	6.2	2134	2510	90.3
10/12/02	3E10	Leveling	1	iwp	29+900	1	668	BS	2440	118	144	6.3	2296	2510	97.2
10/12/02	3E10	Leveling	1	owp	29+920	1	720	BS	2358	117	144	6.5	2214	2510	93.9
10/12/02	3E10	Leveling	1	mid	29+920	1	740	BS	2329	121	149	6.8	2180	2510	92.8
10/12/02	3E10	Leveling	1	iwp	29+920	1	765	BS	2294	118	144	6.7	2150	2510	91.4
10/12/02	3E10	Leveling	1	owp	29+940	1	723	BS	2355	111	135	6.1	2220	2510	93.8
10/12/02	3E10	Leveling	1	mid	29+940	1	680	BS	2421	112	136	6.0	2284	2510	96.4
10/12/02	3E10	Leveling	1	iwp	29+940	1	776	BS	2280	108	131	6.1	2148	2510	90.8
10/12/02	3E10	Leveling	1	owp	29+960	1	653	BS	2465	107	130	5.6	2336	2510	98.2
10/12/02	3E10	Leveling	1	mid	29+960	1	718	BS	2361	117	144	6.5	2217	2510	94.1
10/12/02	3E10	Leveling	1	iwp	29+960	1	760	BS	2300	115	141	6.5	2159	2510	91.7
10/12/02	3E10	Leveling	1	owp	29+980	1	728	BS	2347	109	133	6.0	2214	2510	93.5
10/12/02	3E10	Leveling	1	mid	29+980	1	724	BS	2353	114	139	6.3	2214	2510	93.8
10/12/02	3E10	Leveling	1	iwp	29+980	1	756	BS	2318	118	144	6.6	2174	2510	92.4
10/12/02	3E10	Leveling	1	owp	30+000	1	729	BS	2345	111	135	6.1	2211	2510	93.4
10/12/02	3E10	Leveling	1	mid	30+000	1	735	BS	2336	117	144	6.6	2192	2510	93.1
10/12/02	3E10	Leveling	1	iwp	30+000	1	774	BS	2281	113	138	6.4	2143	2510	90.9
10/12/02	3E10	Leveling	1	owp	30+020	1	732	BS	2341	118	144	6.6	2196	2510	93.2
10/12/02	3E10	Leveling	1	mid	30+020	1	718	BS	2361	112	136	6.1	2225	2510	94.1
10/12/02	3E10	Leveling	1	iwp	30+020	1	730	BS	2344	116	143	6.5	2201	2510	93.4
10/12/02	3E10	Leveling	1	owp	30+040	1	737	BS	2334	114	139	6.4	2195	2510	93.0
10/12/02	3E10	Leveling	1	mid	30+040	1	758	BS	2304	117	144	6.7	2159	2510	91.8
10/12/02	3E10	Leveling	1	iwp	30+040	1	732	BS	2341	116	143	6.5	2198	2510	93.2
10/13/02	3E10	Leveling	1	owp	29+900	2	728	BS	2341	114	138	6.3	2203	2510	93.2
10/13/02	3E10	Leveling	1	mid	29+900	2	758	BS	2297	107	128	5.9	2169	2510	91.5
10/13/02	3E10	Leveling	1	iwp	29+900	2	NA	BS	2240	NA	146	7.0	2094	2510	89.2

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Com-paction
10/13/02	3E10	Leveling	1	owp	29+920	2	781	BS	2265	112	135	6.3	2131	2510	90.2
10/13/02	3E10	Leveling	1	mid	29+920	2	801	BS	2240	119	144	6.9	2095	2510	89.2
10/13/02	3E10	Leveling	1	iwp	29+920	2	800	BS	2241	114	138	6.5	2103	2510	89.3
10/13/02	3E10	Leveling	1	owp	29+940	2	774	BS	2275	110	131	6.1	2143	2510	90.6
10/13/02	3E10	Leveling	1	mid	29+940	2	811	BS	2241	123	149	7.1	2092	2510	89.3
10/13/02	3E10	Leveling	1	iwp	29+940	2	809	BS	2228	121	147	7.1	2081	2510	88.8
10/13/02	3E10	Leveling	1	owp	29+960	2	749	BS	2310	120	146	6.7	2164	2510	92.0
10/13/02	3E10	Leveling	1	mid	29+960	2	757	BS	2299	117	141	6.5	2158	2510	91.6
10/13/02	3E10	Leveling	1	iwp	29+960	2	822	BS	2212	109	130	6.2	2083	2510	88.1
10/13/02	3E10	Leveling	1	owp	29+980	2	784	BS	2262	118	143	6.7	2119	2510	90.1
10/13/02	3E10	Leveling	1	mid	29+980	2	808	BS	2230	120	146	7.0	2084	2510	88.8
10/13/02	3E10	Leveling	1	iwp	29+980	2	808	BS	2230	118	143	6.8	2087	2510	88.8
10/13/02	3E10	Leveling	1	owp	30+000	2	766	BS	2286	120	146	6.8	2140	2510	91.1
10/13/02	3E10	Leveling	1	mid	30+000	2	729	BS	2339	116	139	6.3	2200	2510	93.2
10/13/02	3E10	Leveling	1	iwp	30+000	2	734	BS	2331	117	141	6.4	2190	2510	92.9
10/13/02	3E10	Leveling	1	owp	30+020	2	760	BS	2294	120	146	6.8	2148	2510	91.4
10/13/02	3E10	Leveling	1	mid	30+020	2	784	BS	2262	109	130	6.1	2132	2510	90.1
10/13/02	3E10	Leveling	1	iwp	30+020	2	761	BS	2292	120	146	6.8	2147	2510	91.3
10/13/02	3E10	Leveling	1	owp	30+040	2	758	BS	2297	125	114	5.2	2184	2510	91.5
10/13/02	3E10	Leveling	1	mid	30+040	2	752	BS	2305	127	115	5.3	2190	2510	91.8
10/13/02	3E10	Leveling	1	iwp	30+040	2	768	BS	2283	122	111	5.1	2172	2510	91.0
11/9/02	3E10	Leveling	1	owp	29+900	3	779	BS	2280	110	132	6.1	2148	2510	90.8
11/9/02	3E10	Leveling	1	mid	29+900	3	762	BS	2304	113	136	6.3	2168	2510	91.8
11/9/02	3E10	Leveling	1	iwp	29+900	3	775	BS	2286	110	137	6.1	2149	2510	91.1
11/9/02	3E10	Leveling	1	owp	29+920	3	736	BS	2341	111	33	6	2308	2510	93.3
11/9/02	3E10	Leveling	1	mid	29+920	3	713	BS	2375	117	141	6.3	2234	2510	94.6
11/9/02	3E10	Leveling	1	iwp	29+920	3	787	BS	2270	108	129	6	2141	2510	90.4
11/9/02	3E10	Leveling	1	owp	29+940	3	740	BS	2335	107	128	5.8	2207	2510	93.0
11/9/02	3E10	Leveling	1	mid	29+940	3	775	BS	2286	110	131	6.1	2155	2510	91.1
11/9/02	3E10	Leveling	1	iwp	29+940	3	764	BS	2301	108	129	5.9	2172	2510	91.7
11/9/02	3E10	Leveling	1	owp	29+960	3	714	BS	2373	116	140	6.3	2233	2510	94.5
11/9/02	3E10	Leveling	1	mid	29+960	3	707	BS	2384	114	137	6.1	2247	2510	95.0
11/9/02	3E10	Leveling	1	iwp	29+960	3	746	BS	2326	109	130	5.9	2196	2510	92.7
11/9/02	3E10	Leveling	1	owp	29+980	3	717	BS	2369	114	138	6.2	2231	2510	94.4
11/9/02	3E10	Leveling	1	mid	29+980	3	722	BS	2361	116	140	6.3	2221	2510	94.1
11/9/02	3E10	Leveling	1	iwp	29+980	3	767	BS	2197	109	130	6	2067	2510	87.5
11/9/02	3E10	Leveling	1	owp	30+000	3	741	BS	2334	111	133	6	2201	2510	93.0
11/9/02	3E10	Leveling	1	mid	30+000	3	721	BS	2363	109	130	5.8	2233	2510	94.1
11/9/02	3E10	Leveling	1	iwp	30+000	3	740	BS	2335	113	136	6.2	2199	2510	93.0
11/9/02	3E10	Leveling	1	owp	30+020	3	708	BS	2383	110	132	5.9	2251	2510	94.9
11/9/02	3E10	Leveling	1	mid	30+020	3	749	BS	2322	110	132	6	2190	2510	92.5
11/9/02	3E10	Leveling	1	iwp	30+020	3	749	BS	2322	110	137	6.3	2185	2510	92.5

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Compaction
11/9/02	3E10	Leveling	1	owp	30+040	3	695	BS	2403	115	139	6.1	2264	2510	95.7
11/9/02	3E10	Leveling	1	mid	30+040	3	743	BS	2331	111	133	6.1	2198	2510	92.9
11/9/02	3E10	Leveling	1	iwp	30+040	3	767	BS	2297	104	123	5.7	2174	2510	91.5
11/11/02	3E10	Leveling	1	owp	29+900	4	741	BS	2336	113	134	5.1	2202	2510	93.1
11/11/02	3E10	Leveling	1	mid	29+900	4	740	BS	2338	110	130	5.9	2208	2510	93.1
11/11/02	3E10	Leveling	1	iwp	29+900	4	774	BS	2290	110	130	6	2160	2510	91.2
11/11/02	3E10	Leveling	1	owp	29+920	4	722	BS	2364	112	133	5.9	2231	2510	94.2
11/11/02	3E10	Leveling	1	mid	29+920	4	752	BS	2321	107	126	5.7	2195	2510	92.5
11/11/02	3E10	Leveling	1	iwp	29+920	4	798	BS	2258	108	127	6	2131	2510	90.0
11/11/02	3E10	Leveling	1	owp	29+940	4	739	BS	2339	114	135	6.1	2204	2510	93.2
11/11/02	3E10	Leveling	1	mid	29+940	4	705	BS	2390	114	135	6	2255	2510	95.2
11/11/02	3E10	Leveling	1	iwp	29+940	4	718	BS	2322	107	126	5.7	2196	2510	92.5
11/11/02	3E10	Leveling	1	owp	29+960	4	710	BS	2382	120	143	6.4	2239	2510	94.9
11/11/02	3E10	Leveling	1	mid	29+960	4	754	BS	2318	113	134	6.1	2184	2510	92.4
11/11/02	3E10	Leveling	1	iwp	29+960	4	777	BS	2286	111	131	6.1	2155	2510	91.1
11/11/02	3E10	Leveling	1	owp	29+980	4	809	BS	2244	106	124	5.9	2120	2510	89.4
11/11/02	3E10	Leveling	1	mid	29+980	4	764	BS	2297	111	131	6.1	2166	2510	91.5
11/11/02	3E10	Leveling	1	iwp	29+980	4	804	BS	2250	106	124	5.8	2126	2510	89.6
11/11/02	3E10	Leveling	1	owp	30+000	4	744	BS	2332	113	134	6.1	2198	2510	92.9
11/11/02	3E10	Leveling	1	mid	30+000	4	733	BS	2348	113	134	6	2214	2510	93.5
11/11/02	3E10	Leveling	1	iwp	30+000	4	754	BS	2318	109	128	5.9	2190	2510	92.4
11/11/02	3E10	Leveling	1	owp	30+020	4	761	BS	2308	115	137	6.3	2171	2510	92.0
11/11/02	3E10	Leveling	1	mid	30+020	4	788	BS	2271	109	128	6	2143	2510	90.5
11/11/02	3E10	Leveling	1	iwp	30+020	4	772	BS	2286	113	134	6.2	2152	2510	91.1
11/11/02	3E10	Leveling	1	owp	30+040	4	760	BS	2310	109	128	5.9	2182	2510	92.0
11/11/02	3E10	Leveling	1	mid	30+040	4	795	BS	2262	107	126	5.9	2136	2510	90.1
11/11/02	3E10	Leveling	1	iwp	30+040	4	812	BS	2239	112	133	6.3	2106	2510	89.2
															92.2
															2.0
															98.2
															87.5
															2%
11/24/02	4E10	Wearing	1	owp	29+900	3	727	BS	2347	121	146	6.5	2201	2459	95.4
11/24/02	4E10	Wearing	1	mid	29+900	3	719	BS	2359	125	152	6.9	2207	2459	95.9
11/24/02	4E10	Wearing	1	iwp	29+900	3	751	BS	2312	119	144	6.6	2168	2459	94.0
11/24/02	4E10	Wearing	1	owp	29+900	4	685	BS	2412	119	144	6.7	2268	2459	98.1

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Com-paction
11/24/02	4E10	Wearing	1	mid	29+900	4	723	BS	2353	114	137	6.2	2216	2459	95.7
11/24/02	4E10	Wearing	1	iwp	29+900	4	711	BS	2371	127	155	7	2216	2459	96.4
11/24/02	4E10	Wearing	1	owp	29+920	3	847	BS	2186	113	135	6.6	2051	2459	88.9
11/24/02	4E10	Wearing	1	mid	29+920	3	782	BS	2270	112	134	6.3	2136	2459	92.3
11/24/02	4E10	Wearing	1	iwp	29+920	3	767	BS	2291	110	131	6.1	2160	2459	93.2
11/24/02	4E10	Wearing	1	owp	29+920	4	712	BS	2369	124	150	6.8	2219	2459	96.3
11/24/02	4E10	Wearing	1	mid	29+920	4	748	BS	2317	115	138	6.3	2179	2459	94.2
11/24/02	4E10	Wearing	1	iwp	29+920	4	741	BS	2326	126	153	7	2173	2459	94.6
11/24/02	4E10	Wearing	1	owp	29+940	3	756	BS	2305	124	150	7	2155	2459	93.7
11/24/02	4E10	Wearing	1	mid	29+940	3	725	BS	2349	127	155	7	2194	2459	95.5
11/24/02	4E10	Wearing	1	iwp	29+940	3	716	BS	2363	125	152	6.9	2211	2459	96.1
11/24/02	4E10	Wearing	1	owp	29+940	4	736	BS	2334	123	149	6.8	2185	2459	94.9
11/24/02	4E10	Wearing	1	mid	29+940	4	744	BS	2322	121	146	6.7	2176	2459	94.4
11/24/02	4E10	Wearing	1	iwp	29+940	4	717	BS	2362	125	152	6.9	2210	2459	96.1
11/24/02	4E10	Wearing	1	owp	29+960	3	815	BS	2227	111	133	6.3	2094	2459	90.6
11/24/02	4E10	Wearing	1	mid	29+960	3	707	BS	2377	124	150	6	2227	2459	96.7
11/24/02	4E10	Wearing	1	iwp	29+960	3	740	BS	2328	120	145	6.6	2183	2459	94.7
11/24/02	4E10	Wearing	1	owp	29+960	4	737	BS	2332	122	148	6.8	2184	2459	94.8
11/24/02	4E10	Wearing	1	mid	29+960	4	738	BS	2331	117	141	6.4	2190	2459	94.8
11/24/02	4E10	Wearing	1	iwp	29+960	4	721	BS	2356	119	144	6.5	2212	2459	95.8
11/24/02	4E10	Wearing	1	owp	29+980	3	830	BS	2207	122	148	7.2	2059	2459	89.8
11/24/02	4E10	Wearing	1	mid	29+980	3	734	BS	2337	121	146	6.7	2191	2459	95.0
11/24/02	4E10	Wearing	1	iwp	29+980	3	747	BS	2318	120	145	6.7	2173	2459	94.3
11/24/02	4E10	Wearing	1	owp	29+980	4	712	BS	2369	124	150	6.8	2219	2459	96.3
11/24/02	4E10	Wearing	1	mid	29+980	4	763	BS	2295	123	146	6.9	2149	2459	93.3
11/24/02	4E10	Wearing	1	iwp	29+980	4	714	BS	2366	124	150	6.8	2216	2459	96.2
11/24/02	4E10	Wearing	1	owp	30+000	3	741	BS	2326	122	148	6.8	2178	2459	94.6
11/24/02	4E10	Wearing	1	mid	30+000	3	728	BS	2346	117	141	6.4	2205	2459	95.4
11/24/02	4E10	Wearing	1	iwp	30+000	3	766	BS	2291	120	145	6.7	2146	2459	93.2
11/24/02	4E10	Wearing	1	owp	30+000	4	707	BS	2377	123	149	6.7	2228	2459	96.7
11/24/02	4E10	Wearing	1	mid	30+000	4	724	BS	2352	118	142	6.4	2210	2459	95.6
11/24/02	4E10	Wearing	1	iwp	30+000	4	722	BS	2354	125	152	6.9	2202	2459	95.7
11/24/02	4E10	Wearing	1	owp	30+020	3	794	BS	2253	120	144	6.9	2109	2459	91.6
11/24/02	4E10	Wearing	1	mid	30+020	3	748	BS	2316	129	157	7.3	2159	2459	94.2
11/24/02	4E10	Wearing	1	iwp	30+020	3	743	BS	2323	127	156	7.1	2167	2459	94.5
11/24/02	4E10	Wearing	1	owp	30+020	4	728	BS	2345	122	148	6.7	2197	2459	95.4
11/24/02	4E10	Wearing	1	mid	30+020	4	731	BS	2341	121	146	6.7	2195	2459	95.2
11/24/02	4E10	Wearing	1	iwp	30+020	4	745	BS	2321	118	142	6.5	2179	2459	94.4
11/24/02	4E10	Wearing	1	owp	30+040	3	764	BS	2294	115	138	6.4	2156	2459	93.3
11/24/02	4E10	Wearing	1	mid	30+040	3	776	BS	2337	110	131	6.1	2206	2459	95.0
11/24/02	4E10	Wearing	1	iwp	30+040	3	734	BS	2337	122	148	6.7	2189	2459	95.0
11/24/02	4E10	Wearing	1	owp	30+040	4	799	BS	2247	123	149	7.1	2098	2459	91.4

							Nuclear Density Gauge Data							
Test	Layer	Test	Test Section	Test Location	Station	Lane	Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Com-paction
11/24/02	4E10	Wearing	1	mid	30+040	4	765	BS	2293	119	144	6.7	2149	2459	93.2
11/24/02	4E10	Wearing	1	iwp	30+040	4	757	BS	2304	120	145	6.7	2159	2459	93.7
11/27/02	4E10	Wearing	1	owp	29+900	1	734	BS	2332	123	149	6.8	2183	2459	94.8
11/27/02	4E10	Wearing	1	mid	29+900	1	782	BS	2265	119	144	6.8	2121	2459	92.1
11/27/02	4E10	Wearing	1	iwp	29+900	1	734	BS	2332	121	147	6.7	2185	2459	94.8
11/27/02	4E10	Wearing	1	owp	29+900	2	752	BS	2306	121	146	6.8	2160	2459	93.8
11/27/02	4E10	Wearing	1	mid	29+900	2	755	BS	2302	119	144	6.7	2158	2459	93.6
11/27/02	4E10	Wearing	1	iwp	29+900	2	781	BS	2266	119	144	6.8	2122	2459	92.2
11/27/02	4E10	Wearing	1	owp	29+920	1	746	BS	2315	113	135	6.2	2180	2459	94.1
11/27/02	4E10	Wearing	1	mid	29+920	1	744	BS	2318	122	148	6.8	2170	2459	94.3
11/27/02	4E10	Wearing	1	iwp	29+920	1	773	BS	2277	119	144	6.7	2133	2459	92.6
11/27/02	4E10	Wearing	1	owp	29+920	2	740	BS	2324	119	144	6.6	2180	2459	94.5
11/27/02	4E10	Wearing	1	mid	29+920	2	742	BS	2320	124	151	6.9	2169	2459	94.3
11/27/02	4E10	Wearing	1	iwp	29+920	2	750	BS	2254	120	145	6.9	2109	2459	91.7
11/27/02	4E10	Wearing	1	owp	29+940	1	749	BS	2311	117	141	6.5	2170	2459	94.0
11/27/02	4E10	Wearing	1	mid	29+940	1	775	BS	2275	113	135	6.3	2140	2459	92.5
11/27/02	4E10	Wearing	1	iwp	29+940	1	760	BS	2295	116	140	6.5	2155	2459	93.3
11/27/02	4E10	Wearing	1	owp	29+940	2	745	BS	2316	125	152	7	2164	2459	94.2
11/27/02	4E10	Wearing	1	mid	29+940	2	744	BS	2318	122	148	6.8	2170	2459	94.3
11/27/02	4E10	Wearing	1	iwp	29+940	2	769	BS	2233	119	144	6.7	2089	2459	90.8
11/27/02	4E10	Wearing	1	owp	29+960	1	755	BS	2302	118	142	6.6	2160	2459	93.6
11/27/02	4E10	Wearing	1	mid	29+960	1	772	BS	2279	119	144	6.7	2135	2459	92.7
11/27/02	4E10	Wearing	1	iwp	29+960	1	746	BS	2315	122	148	6.8	2167	2459	94.1
11/27/02	4E10	Wearing	1	owp	29+960	2	732	BS	2335	120	125	6.6	2210	2459	95.0
11/27/02	4E10	Wearing	1	mid	29+960	2	748	BS	2312	124	151	7	2161	2459	94.0
11/27/02	4E10	Wearing	1	iwp	29+960	2	777	BS	2271	125	152	7.2	2119	2459	92.4
11/27/02	4E10	Wearing	1	owp	29+980	1	727	BS	2342	122	148	6.7	2194	2459	95.2
11/27/02	4E10	Wearing	1	mid	29+980	1	805	BS	2235	119	144	6.9	2091	2459	90.9
11/27/02	4E10	Wearing	1	iwp	29+980	1	748	BS	2312	119	144	6.6	2168	2459	94.0
11/27/02	4E10	Wearing	1	owp	29+980	2	719	BS	2354	124	151	6.8	2203	2459	95.7
11/27/02	4E10	Wearing	1	mid	29+980	2	746	BS	2315	123	149	6.9	2166	2459	94.1
11/27/02	4E10	Wearing	1	iwp	29+980	2	793	BS	2250	125	152	7.2	2098	2459	91.5
11/27/02	4E10	Wearing	1	owp	30+000	1	730	BS	2338	117	141	6.4	2197	2459	95.1
11/27/02	4E10	Wearing	1	mid	30+000	1	794	BS	2249	116	140	6.6	2109	2459	91.5
11/27/02	4E10	Wearing	1	iwp	30+000	1	707	BS	2372	119	148	6.6	2224	2459	96.5
11/27/02	4E10	Wearing	1	owp	30+000	2	743	BS	2319	122	148	6.8	2171	2459	94.3
11/27/02	4E10	Wearing	1	mid	30+000	2	729	BS	2340	116	140	6.3	2200	2459	95.2
11/27/02	4E10	Wearing	1	iwp	30+000	2	768	BS	2284	122	148	6.9	2136	2459	92.9
11/27/02	4E10	Wearing	1	owp	30+020	1	787	BS	2259	110	131	6.2	2128	2459	91.9
11/27/02	4E10	Wearing	1	mid	30+020	1	753	BS	2305	124	151	7	2154	2459	93.7
11/27/02	4E10	Wearing	1	iwp	30+020	1	772	BS	2279	119	144	6.7	2135	2459	92.7
11/27/02	4E10	Wearing	1	owp	30+020	2	756	BS	2301	120	145	6.7	2156	2459	93.6

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.	Dry Density	Max. Density	Compaction
11/27/02	4E10	Wearing	1	mid	30+020	2	729	BS	2339	122	147	6.7	2192	2459	95.1
11/27/02	4E10	Wearing	1	iwp	30+020	2	743	BS	2319	118	142	6.5	2177	2459	94.3
11/27/02	4E10	Wearing	1	owp	30+040	1	726	BS	2344	151	147	6.7	2197	2459	95.3
11/27/02	4E10	Wearing	1	mid	30+040	1	731	BS	2337	116	140	6.4	2197	2459	95.0
11/27/02	4E10	Wearing	1	iwp	30+040	1	743	BS	2319	121	147	6.7	2172	2459	94.3
11/27/02	4E10	Wearing	1	owp	30+040	2	739	BS	2325	120	145	6.7	2180	2459	94.6
11/27/02	4E10	Wearing	1	mid	30+040	2	752	BS	2306	122	148	6.8	2158	2459	93.8
11/27/02	4E10	Wearing	1	iwp	30+040	2	802	BS	2239	118	142	6.8	2097	2459	91.1

94.1
1.7
98.1
88.9
2%

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Com-paction
8/26/02	2E10	Base	2	owp	30+960	1	716	BS	2370	107	126	5.6	2244	2513	94.3
8/26/02	2E10	Base	2	mid	30+960	1	676	BS	2423	109	129	5.6	2294	2513	96.4
8/26/02	2E10	Base	2	iwp	30+960	1	718	BS	2358	102	119	5.3	2239	2513	93.8
8/26/02	2E10	Base	2	owp	30+980	1	724	BS	2348	112	133	6	2215	2513	93.4
8/26/02	2E10	Base	2	mid	30+980	1	656	BS	2456	108	127	5.5	2329	2513	97.7
8/26/02	2E10	Base	2	iwp	30+980	1	688	BS	2405	97	112	4.9	2293	2513	95.7
8/26/02	2E10	Base	2	owp	31+000	1	722	BS	2351	111	131	5.9	2220	2513	93.6
8/26/02	2E10	Base	2	mid	31+000	1	652	BS	2463	107	126	5.4	2337	2513	98.0
8/26/02	2E10	Base	2	iwp	31+000	1	683	BS	2412	101	118	5.1	2294	2513	96.0
8/26/02	2E10	Base	2	owp	31+020	1	705	BS	2376	106	125	5.5	2251	2513	94.5
8/26/02	2E10	Base	2	mid	31+020	1	651	BS	2464	122	146	6.3	2318	2513	98.1
8/26/02	2E10	Base	2	iwp	31+020	1	725	BS	2398	99	115	5.1	2283	2513	95.4
8/26/02	2E10	Base	2	owp	31+040	1	712	BS	2367	106	125	5.6	2242	2513	94.2
8/26/02	2E10	Base	2	mid	31+040	1	643	BS	2478	116	138	5.9	2340	2513	98.6
8/26/02	2E10	Base	2	iwp	31+040	1	757	BS	2302	98	114	5.2	2188	2513	91.6
8/26/02	2E10	Base	2	owp	31+060	1	679	BS	2418	107	126	5.5	2292	2513	96.2
8/26/02	2E10	Base	2	mid	31+060	1	652	BS	2463	114	136	5.6	2327	2513	98.0
8/26/02	2E10	Base	2	iwp	31+060	1	682	BS	2414	103	120	5.3	2294	2513	96.1
8/26/02	2E10	Base	2	owp	31+080	1	692	BS	2398	103	120	5.3	2278	2513	95.4
8/26/02	2E10	Base	2	mid	31+080	1	650	BS	2466	118	141	6.1	2325	2513	98.1
8/26/02	2E10	Base	2	iwp	31+080	1	690	BS	2401	104	122	5.3	2279	2513	95.5
8/26/02	2E10	Base	2	owp	31+100	1	698	BS	2388	108	127	5.6	2261	2513	95.0
8/26/02	2E10	Base	2	mid	31+100	1	674	BS	2426	112	133	5.6	2293	2513	96.5
8/26/02	2E10	Base	2	iwp	31+100	1	588	BS	2404	103	120	5.3	2284	2513	95.7
8/26/02	2E10	Base	2	owp	30+960	2	785	BS	2263	106	125	5.8	2138	2513	90.1
8/26/02	2E10	Base	2	mid	30+960	2	753	BS	2307	101	118	5.4	2189	2513	91.8
8/26/02	2E10	Base	2	iwp	30+960	2	822	BS	2216	88	100	4.7	2116	2513	88.2
8/26/02	2E10	Base	2	owp	30+980	2	765	BS	2289	87	112	5.2	2177	2513	91.1
8/26/02	2E10	Base	2	mid	30+980	2	827	BS	2209	99	115	5.5	2094	2513	87.9
8/26/02	2E10	Base	2	iwp	30+980	2	792	BS	2254	97	112	5.2	2142	2513	89.7
8/26/02	2E10	Base	2	owp	31+000	2	749	BS	2312	106	122	5.7	2190	2513	92.0
8/26/02	2E10	Base	2	mid	31+000	2	750	BS	2311	103	120	5.5	2191	2513	92.0
8/26/02	2E10	Base	2	iwp	31+000	2	744	BS	2320	104	122	5.5	2198	2513	92.3
8/26/02	2E10	Base	2	owp	31+020	2	737	BS	2330	101	118	5.3	2212	2513	92.7
8/26/02	2E10	Base	2	mid	31+020	2	745	BS	2319	93	127	4.8	2192	2513	92.3
8/26/02	2E10	Base	2	iwp	31+020	2	750	BS	2312	98	114	5.2	2198	2513	92.0
8/26/02	2E10	Base	2	owp	31+040	2	748	BS	2314	104	122	5.6	2192	2513	92.1
8/26/02	2E10	Base	2	mid	31+040	2	734	BS	2334	106	125	5.6	2209	2513	92.9
8/26/02	2E10	Base	2	iwp	31+040	2	783	BS	2266	95	110	5.1	2156	2513	90.2
8/26/02	2E10	Base	2	owp	31+060	2	749	BS	2313	102	119	5.4	2194	2513	92.0
8/26/02	2E10	Base	2	mid	31+060	2	721	BS	2354	103	120	5.4	2234	2513	93.7
8/26/02	2E10	Base	2	iwp	31+060	2	748	BS	2314	110	130	6	2184	2513	92.1

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Com-paction
8/26/02	2E10	Base	2	owp	31+080	2	791	BS	2255	102	119	5.6	2136	2513	89.7
8/26/02	2E10	Base	2	mid	31+080	2	732	BS	2337	108	127	5.8	2210	2513	93.0
8/26/02	2E10	Base	2	iwp	31+080	2	783	BS	2266	102	119	5.5	2147	2513	90.2
8/26/02	2E10	Base	2	owp	31+100	2	791	BS	2255	99	115	5.4	2140	2513	89.7
8/26/02	2E10	Base	2	mid	31+100	2	749	BS	2313	102	119	5.4	2194	2513	92.0
8/26/02	2E10	Base	2	iwp	31+100	2	781	BS	2256	89	101	4.7	2155	2513	89.8
10/12/02	2E10	Base	2	owp	30+960	1	695	BS	2397	122	151	6.7	2246	2513	95.4
10/12/02	2E10	Base	2	mid	30+960	1	696	BS	2395	116	143	6.3	2252	2513	95.3
10/12/02	2E10	Base	2	iwp	30+960	1	679	BS	2422	116	143	6.3	2280	2513	96.4
10/12/02	2E10	Base	2	owp	30+960	2	751	BS	2313	109	133	6.1	2180	2513	92.1
10/12/02	2E10	Base	2	mid	30+960	2	727	BS	2349	110	133	6.0	2216	2513	93.5
10/12/02	2E10	Base	2	iwp	30+960	2	738	BS	2333	117	144	6.6	2188	2513	92.8
10/12/02	2E10	Base	2	owp	30+980	1	737	BS	2334	110	133	6.0	2201	2513	92.9
10/12/02	2E10	Base	2	mid	30+980	1	734	BS	2337	114	139	6.3	2198	2513	93.0
10/12/02	2E10	Base	2	iwp	30+980	1	716	BS	2361	112	136	6.1	2225	2513	94.0
10/12/02	2E10	Base	2	owp	30+980	2	717	BS	2363	116	159	7.2	2204	2513	94.0
10/12/02	2E10	Base	2	mid	30+980	2	729	BS	2345	121	149	6.8	2196	2513	93.3
10/12/02	2E10	Base	2	iwp	30+980	2	729	BS	2345	118	144	6.6	2201	2513	93.3
10/12/02	2E10	Base	2	owp	31+000	1	680	BS	2421	113	138	6.0	2283	2513	96.3
10/12/02	2E10	Base	2	mid	31+000	1	674	BS	2430	126	155	6.8	2275	2513	96.7
10/12/02	2E10	Base	2	iwp	31+000	1	679	BS	2422	110	144	6.3	2278	2513	96.4
10/12/02	2E10	Base	2	owp	31+000	2	751	BS	2313	116	143	6.6	2171	2513	92.1
10/12/02	2E10	Base	2	mid	31+000	2	752	BS	2312	122	151	7.0	2161	2513	92.0
10/12/02	2E10	Base	2	iwp	31+000	2	758	BS	2304	117	144	6.7	2159	2513	91.7
10/12/02	2E10	Base	2	owp	31+020	1	699	BS	2390	114	139	6.2	2251	2513	95.1
10/12/02	2E10	Base	2	mid	31+020	1	717	BS	2361	131	163	7.4	2198	2513	94.0
10/12/02	2E10	Base	2	iwp	31+020	1	694	BS	2398	121	149	6.6	2249	2513	95.4
10/12/02	2E10	Base	2	owp	31+020	2	729	BS	2345	114	143	6.5	2203	2513	93.3
10/12/02	2E10	Base	2	mid	31+020	2	728	BS	2347	116	143	6.5	2204	2513	93.4
10/12/02	2E10	Base	2	iwp	31+020	2	717	BS	2363	117	144	6.5	2219	2513	94.0
10/12/02	2E10	Base	2	owp	31+040	1	642	BS	2485	119	146	6.2	2339	2513	98.9
10/12/02	2E10	Base	2	mid	31+040	1	641	BS	2486	121	149	6.4	2337	2513	98.9
10/12/02	2E10	Base	2	iwp	31+040	1	645	BS	2467	117	144	6.2	2323	2513	98.2
10/12/02	2E10	Base	2	owp	31+040	2	721	BS	2357	116	143	6.4	2214	2513	93.8
10/12/02	2E10	Base	2	mid	31+040	2	715	BS	2366	116	143	6.4	2224	2513	94.2
10/12/02	2E10	Base	2	iwp	31+040	2	721	BS	2357	118	144	6.5	2212	2513	93.8
10/12/02	2E10	Base	2	owp	31+060	1	679	BS	2422	112	136	6.0	2286	2513	96.4
10/12/02	2E10	Base	2	mid	31+060	1	683	BS	2416	113	138	6.0	2278	2513	96.1
10/12/02	2E10	Base	2	iwp	31+060	1	678	BS	2424	114	128	5.6	2296	2513	96.5
10/12/02	2E10	Base	2	owp	31+060	2	731	BS	2342	123	152	6.9	2190	2513	93.2
10/12/02	2E10	Base	2	mid	31+060	2	725	BS	2352	116	143	6.5	2209	2513	93.6
10/12/02	2E10	Base	2	iwp	31+060	2	734	BS	2339	111	135	6.1	2204	2513	93.1

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Compaction
10/12/02	2E10	Base	2	owp	31+080	1	751	BS	2313	117	144	6.6	2169	2513	92.1
10/12/02	2E10	Base	2	mid	31+080	1	744	BS	2323	129	151	6.9	2172	2513	92.4
10/12/02	2E10	Base	2	iwp	31+080	1	NA	BS	2334	NA	147	6.7	2187	2513	92.9
10/12/02	2E10	Base	2	owp	31+080	2	647	BS	2477	109	133	5.7	2344	2513	98.6
10/12/02	2E10	Base	2	mid	31+080	2	650	BS	2470	111	135	5.8	2336	2513	98.3
10/12/02	2E10	Base	2	iwp	31+080	2	647	BS	2475	115	141	6.0	2334	2513	98.5
10/12/02	2E10	Base	2	owp	31+100	1	712	BS	2371	121	149	6.7	2222	2513	94.3
10/12/02	2E10	Base	2	mid	31+100	1	708	BS	2382	120	147	6.6	2235	2513	94.8
10/12/02	2E10	Base	2	iwp	31+100	1	698	BS	2392	123	152	6.8	2240	2513	95.2
10/12/02	2E10	Base	2	owp	31+100	2	657	BS	2459	117	144	6.2	2315	2513	97.9
10/12/02	2E10	Base	2	mid	31+100	2	651	BS	2469	115	141	6.1	2328	2513	98.2
10/12/02	2E10	Base	2	iwp	31+100	2	674	BS	2421	119	146	6.4	2275	2514	96.3
11/11/02	2E10	Base	2	owp	30+960	4	767	BS	2300	102	119	5.4	2181	2513	91.5
11/11/02	2E10	Base	2	mid	30+960	4	725	BS	2360	108	127	5.7	2233	2513	93.9
11/11/02	2E10	Base	2	iwp	30+960	4	779	BS	2284	105	123	5.7	2161	2513	90.9
11/11/02	2E10	Base	2	owp	30+980	4	740	BS	2339	101	118	5.3	2221	2513	93.1
11/11/02	2E10	Base	2	mid	30+980	4	717	BS	2372	108	127	5.7	2245	2513	94.4
11/11/02	2E10	Base	2	iwp	30+980	4	742	BS	2336	101	118	5.3	2218	2513	93.0
11/11/02	2E10	Base	2	owp	31+000	4	728	BS	2356	108	127	5.7	2229	2513	93.8
11/11/02	2E10	Base	2	mid	31+000	4	697	BS	2403	110	130	5.7	2273	2513	95.6
11/11/02	2E10	Base	2	iwp	31+000	4	723	BS	2363	110	130	5.8	2233	2513	94.0
11/11/02	2E10	Base	2	owp	31+020	4	755	BS	2316	110	129	5.9	2187	2513	92.2
11/11/02	2E10	Base	2	mid	31+020	4	723	BS	2363	111	131	5.9	2232	2513	94.0
11/11/02	2E10	Base	2	iwp	31+020	4	762	BS	2307	105	123	5.6	2184	2513	91.8
11/11/02	2E10	Base	2	owp	31+040	4	751	BS	2323	99	115	5.2	2208	2513	92.4
11/11/02	2E10	Base	2	mid	31+040	4	713	BS	2370	105	123	5.5	2247	2513	94.3
11/11/02	2E10	Base	2	iwp	31+040	4	726	BS	2359	103	120	5.4	2239	2513	93.9
11/11/02	2E10	Base	2	owp	31+060	4	764	BS	2332	108	127	5.6	2205	2513	92.8
11/11/02	2E10	Base	2	mid	31+060	4	699	BS	2400	111	131	5.8	2269	2513	95.5
11/11/02	2E10	Base	2	iwp	31+060	4	715	BS	2325	104	122	5.4	2203	2513	92.5
11/11/02	2E10	Base	2	owp	31+080	4	730	BS	2353	106	125	5.6	2228	2513	93.6
11/11/02	2E10	Base	2	mid	31+080	4	725	BS	2360	103	128	5.4	2232	2513	93.9
11/11/02	2E10	Base	2	iwp	31+080	4	753	BS	2320	106	124	5.7	2196	2513	92.3
11/11/02	2E10	Base	2	owp	31+100	4	736	BS	2344	110	130	5.9	2214	2513	93.3
11/11/02	2E10	Base	2	mid	31+100	4	742	BS	2335	103	124	5.6	2211	2513	92.9
11/11/02	2E10	Base	2	iwp	31+100	4	766	BS	2302	103	120	5.5	2182	2513	91.6
															94.0
															2.4
															98.9
															87.9
															3%

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Compaction
10/12/02	3E10	Leveling	2	owp	30+960	1	809	BS	2235	113	138	6.6	2097	2510	89.0
10/12/02	3E10	Leveling	2	mid	30+960	1	778	BS	2275	123	151	7.1	2124	2510	90.6
10/12/02	3E10	Leveling	2	iwp	30+960	1	769	BS	2296	117	144	6.7	2151	2510	91.5
10/12/02	3E10	Leveling	2	owp	30+980	1	770	BS	2288	114	139	6.5	2148	2510	91.1
10/12/02	3E10	Leveling	2	mid	30+980	1	772	BS	2278	111	135	6.3	2143	2510	90.8
10/12/02	3E10	Leveling	2	iwp	30+980	1	762	BS	2297	116	143	6.6	2155	2510	91.5
10/12/02	3E10	Leveling	2	owp	31+000	1	795	BS	2246	115	141	6.7	2105	2510	89.5
10/12/02	3E10	Leveling	2	mid	31+000	1	780	BS	2273	121	149	7.0	2124	2510	90.6
10/12/02	3E10	Leveling	2	iwp	31+000	1	760	BS	2300	117	144	6.7	2156	2510	91.7
10/12/02	3E10	Leveling	2	owp	31+020	1	796	BS	2252	113	138	6.5	2115	2510	89.7
10/12/02	3E10	Leveling	2	mid	31+020	1	757	BS	2305	114	155	7.2	2150	2510	91.8
10/12/02	3E10	Leveling	2	iwp	31+020	1	854	BS	2179	115	141	6.9	2038	2510	86.8
10/12/02	3E10	Leveling	2	owp	31+040	1	838	BS	2200	107	130	6.3	2070	2510	87.6
10/12/02	3E10	Leveling	2	mid	31+040	1	751	BS	2313	122	151	7.0	2163	2510	92.2
10/12/02	3E10	Leveling	2	iwp	31+040	1	761	BS	2299	112	136	6.3	2163	2510	91.6
10/12/02	3E10	Leveling	2	owp	31+060	1	876	BS	2161	112	136	6.7	2025	2510	86.1
10/12/02	3E10	Leveling	2	mid	31+060	1	761	BS	2299	116	143	6.6	2156	2510	91.6
10/12/02	3E10	Leveling	2	iwp	31+060	1	703	BS	2270	113	138	6.5	2132	2510	90.4
10/12/02	3E10	Leveling	2	owp	31+080	1	801	BS	2246	114	139	6.6	2107	2510	89.5
10/12/02	3E10	Leveling	2	mid	31+080	1	758	BS	2294	114	139	6.5	2155	2510	91.4
10/12/02	3E10	Leveling	2	iwp	31+080	1	776	BS	2278	114	139	6.5	2139	2510	90.8
10/12/02	3E10	Leveling	2	owp	31+100	1	798	BS	2249	113	138	6.5	2111	2510	89.6
10/12/02	3E10	Leveling	2	mid	31+100	1	782	BS	2270	120	147	6.9	2123	2510	90.4
10/12/02	3E10	Leveling	2	iwp	31+100	1	790	BS	2260	119	146	6.9	2115	2510	90.1
10/13/02	3E10	Leveling	2	owp	30+960	2	757	BS	2299	119	144	6.7	2155	2510	91.6
10/13/02	3E10	Leveling	2	mid	30+960	2	765	BS	2288	123	149	7.0	2139	2510	91.1
10/13/02	3E10	Leveling	2	iwp	30+960	2	756	BS	2300	115	138	6.4	2163	2510	91.7
10/13/02	3E10	Leveling	2	owp	30+980	2	805	BS	2235	112	135	6.4	2100	2510	89.0
10/13/02	3E10	Leveling	2	mid	30+980	2	777	BS	2270	121	147	6.9	2123	2510	90.4
10/13/02	3E10	Leveling	2	iwp	30+980	2	771	BS	2280	111	133	6.2	2147	2510	90.8
10/13/02	3E10	Leveling	2	owp	31+000	2	781	BS	2267	110	131	6.2	2135	2510	90.3
10/13/02	3E10	Leveling	2	mid	31+000	2	763	BS	2291	116	139	6.5	2151	2510	91.3
10/13/02	3E10	Leveling	2	iwp	31+000	2	785	BS	2260	122	147	7.0	2113	2510	90.1
10/13/02	3E10	Leveling	2	owp	31+020	2	749	BS	2310	115	138	6.3	2172	2510	92.0
10/13/02	3E10	Leveling	2	mid	31+020	2	757	BS	2299	120	146	6.8	2153	2510	91.6
10/13/02	3E10	Leveling	2	iwp	31+020	2	773	BS	2276	113	136	6.4	2140	2510	90.7
10/13/02	3E10	Leveling	2	owp	31+040	2	769	BS	2283	115	138	6.4	2145	2510	91.0
10/13/02	3E10	Leveling	2	mid	31+040	2	789	BS	2294	108	141	6.5	2153	2510	91.4

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Com-paction
10/13/02	3E10	Leveling	2	iwp	31+040	2	755	BS	2300	123	149	6.9	2151	2510	91.7
10/13/02	3E10	Leveling	2	owp	31+060	2	742	BS	2321	112	144	6.6	2177	2510	92.5
10/13/02	3E10	Leveling	2	mid	31+060	2	767	BS	2284	112	135	6.3	2150	2510	91.0
10/13/02	3E10	Leveling	2	iwp	31+060	2	753	BS	2304	118	143	6.6	2161	2510	91.8
10/13/02	3E10	Leveling	2	owp	31+080	2	764	BS	2289	119	144	6.7	2145	2510	91.2
10/13/02	3E10	Leveling	2	mid	31+080	2	748	BS	2312	119	144	6.7	2168	2510	92.1
10/13/02	3E10	Leveling	2	iwp	31+080	2	767	BS	2284	116	139	6.5	2145	2510	91.0
10/13/02	3E10	Leveling	2	owp	31+100	2	783	BS	2264	111	133	6.2	2131	2510	90.2
10/13/02	3E10	Leveling	2	mid	31+100	2	769	BS	2281	118	143	6.7	2139	2510	90.9
10/13/02	3E10	Leveling	2	iwp	31+100	2	773	BS	2276	117	141	6.6	2135	2510	90.7
11/11/02	3E10	Leveling	2	owp	30+960	3	742	BS	2335	110	130	5.9	2205	2510	93.0
11/11/02	3E10	Leveling	2	mid	30+960	3	731	BS	2351	114	135	6.1	2216	2510	93.7
11/11/02	3E10	Leveling	2	iwp	30+960	3	706	BS	2388	117	139	6.2	2249	2510	95.1
11/11/02	3E10	Leveling	2	owp	30+980	3	714	BS	2376	118	141	6.3	2235	2510	94.7
11/11/02	3E10	Leveling	2	mid	30+980	3	718	BS	2370	112	132	5.9	2238	2510	94.4
11/11/02	3E10	Leveling	2	iwp	30+980	3	715	BS	2375	116	130	6.2	2245	2510	94.6
11/11/02	3E10	Leveling	2	owp	31+000	3	856	BS	2183	128	154	7.6	2029	2510	87.0
11/11/02	3E10	Leveling	2	mid	31+000	3	854	BS	2197	123	148	7.2	2049	2510	87.5
11/11/02	3E10	Leveling	2	iwp	31+000	3	775	BS	2287	130	157	7.4	2130	2510	91.1
11/11/02	3E10	Leveling	2	owp	31+020	3	775	BS	2283	119	142	6.6	2141	2510	91.0
11/11/02	3E10	Leveling	2	mid	31+020	3	759	BS	2310	118	141	6.5	2169	2510	92.0
11/11/02	3E10	Leveling	2	iwp	31+020	3	757	BS	2313	118	141	6.5	2172	2510	92.2
11/11/02	3E10	Leveling	2	owp	31+040	3	744	BS	2332	111	131	6	2201	2510	92.9
11/11/02	3E10	Leveling	2	mid	31+040	3	763	BS	2362	123	148	6.7	2214	2510	94.1
11/11/02	3E10	Leveling	2	iwp	31+040	3	769	BS	2296	121	145	6.7	2151	2510	91.5
11/11/02	3E10	Leveling	2	owp	31+060	3	755	BS	2316	114	135	6.2	2181	2510	92.3
11/11/02	3E10	Leveling	2	mid	31+060	3	725	BS	2368	116	138	6.2	2230	2510	94.3
11/11/02	3E10	Leveling	2	iwp	31+060	3	731	BS	2350	123	148	6.7	2202	2510	93.6
11/11/02	3E10	Leveling	2	owp	31+080	3	691	BS	2412	118	141	6.2	2271	2510	96.1
11/11/02	3E10	Leveling	2	mid	31+080	3	683	BS	2424	122	146	6.4	2278	2510	96.6
11/11/02	3E10	Leveling	2	iwp	31+080	3	709	BS	2384	114	135	6	2249	2510	95.0
11/11/02	3E10	Leveling	2	owp	31+100	3	713	BS	2377	120	143	6.4	2234	2510	94.7
11/11/02	3E10	Leveling	2	mid	31+100	3	731	BS	2351	113	134	6	2217	2510	93.7
11/11/02	3E10	Leveling	2	iwp	31+100	3	756	BS	2315	118	141	6.5	2174	2510	92.2
11/11/02	3E10	Leveling	2	mid	30+960	4	777	BS	2286	111	131	6.1	2155	2510	91.1
11/11/02	3E10	Leveling	2	mid	30+980	4	762	BS	2307	110	130	6	2177	2510	91.9
11/11/02	3E10	Leveling	2	mid	31+000	4	785	BS	2275	110	130	6	2145	2510	90.6
11/11/02	3E10	Leveling	2	mid	31+020	4	733	BS	2348	109	128	5.8	2220	2510	93.5
11/11/02	3E10	Leveling	2	mid	31+040	4	708	BS	2388	115	137	6.1	2251	2510	95.1
11/11/02	3E10	Leveling	2	mid	31+060	4	746	BS	2329	111	131	6	2198	2510	92.8
11/11/02	3E10	Leveling	2	mid	31+080	4	769	BS	2297	112	133	6.1	2164	2510	91.5
11/11/02	3E10	Leveling	2	mid	31+100	4	785	BS	2275	110	130	6	2145	2510	90.6

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Compaction
															91.5
															2.0
															96.6
															86.1
															2%
11/24/02	4E10	Wearing	2	owp	30+960	4	728	BS	2346	118	142	6.4	2204	2459	95.4
11/24/02	4E10	Wearing	2	mid	30+960	4	718	BS	2360	129	157	7.1	2203	2459	96.0
11/24/02	4E10	Wearing	2	iwp	30+960	4	712	BS	2369	124	150	6.8	2219	2459	96.3
11/24/02	4E10	Wearing	2	owp	30+980	4	730	BS	2343	121	146	6.7	2197	2459	95.3
11/24/02	4E10	Wearing	2	mid	30+980	4	742	BS	2325	119	144	6.6	2181	2459	94.6
11/24/02	4E10	Wearing	2	iwp	30+980	4	780	BS	2272	119	144	6.7	2128	2459	92.4
11/24/02	4E10	Wearing	2	owp	31+000	4	768	BS	2389	116	139	6.5	2250	2459	97.2
11/24/02	4E10	Wearing	2	mid	31+000	4	887	BS	2138	120	145	7.3	1993	2459	86.9
11/24/02	4E10	Wearing	2	iwp	31+000	4	742	BS	2325	124	150	6.9	2175	2459	94.6
11/24/02	4E10	Wearing	2	owp	31+020	4	719	BS	2315	119	144	6.6	2171	2459	94.1
11/24/02	4E10	Wearing	2	mid	31+020	4	723	BS	2346	120	145	6.6	2201	2459	95.4
11/24/02	4E10	Wearing	2	iwp	31+020	4	739	BS	2330	119	144	6.6	2186	2459	94.8
11/24/02	4E10	Wearing	2	owp	31+040	4	716	BS	2364	117	141	6.3	2223	2459	96.1
11/24/02	4E10	Wearing	2	mid	31+040	4	745	BS	2321	121	146	6.7	2175	2459	94.4
11/24/02	4E10	Wearing	2	iwp	31+040	4	731	BS	2341	118	142	6.5	2199	2459	95.2
11/24/02	4E10	Wearing	2	owp	31+060	4	721	BS	2356	120	145	6.6	2211	2459	95.8
11/24/02	4E10	Wearing	2	mid	31+060	4	715	BS	2365	122	147	6.7	2218	2459	96.2
11/24/02	4E10	Wearing	2	iwp	31+060	4	706	BS	2329	118	142	6.4	2187	2459	94.7
11/24/02	4E10	Wearing	2	owp	31+080	4	782	BS	2270	117	141	6.6	2129	2459	92.3
11/24/02	4E10	Wearing	2	mid	31+080	4	743	BS	2324	119	144	6.6	2180	2459	94.5
11/24/02	4E10	Wearing	2	iwp	31+080	4	742	BS	2325	116	139	6.4	2186	2459	94.6
11/24/02	4E10	Wearing	2	owp	31+100	4	718	BS	2361	117	141	6.3	2220	2459	96.0
11/24/02	4E10	Wearing	2	mid	31+100	4	728	BS	2345	123	149	6.8	2196	2459	95.4
11/24/02	4E10	Wearing	2	iwp	31+100	4	715	BS	2365	116	139	6.3	2226	2459	96.2
11/26/02	4E10	Wearing	2	owp	30+960	3	759	BS	2305	116	139	6.4	2166	2459	93.7
11/26/02	4E10	Wearing	2	mid	30+960	3	839	BS	2200	112	134	6.5	2066	2459	89.5
11/26/02	4E10	Wearing	2	iwp	30+960	3	829	BS	2212	115	138	6.6	2074	2459	90.0
11/26/02	4E10	Wearing	2	owp	30+980	3	731	BS	2345	121	146	6.6	2199	2459	95.4
11/26/02	4E10	Wearing	2	mid	30+980	3	779	BS	2279	118	142	6.6	2137	2459	92.7
11/26/02	4E10	Wearing	2	iwp	30+980	3	735	BS	2339	121	146	6.7	2193	2459	95.1
11/26/02	4E10	Wearing	2	owp	31+000	3	767	BS	2293	126	153	7.1	2140	2459	93.2
11/26/02	4E10	Wearing	2	mid	31+000	3	721	BS	2360	125	152	6.9	2208	2459	96.0

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Com-paction
11/27/02	4E10	Wearing	2	iwp	31+040	1	735	BS	2331	121	147	6.7	2184	2459	94.8
11/27/02	4E10	Wearing	2	owp	31+040	2	738	BS	2326	126	153	7.1	2173	2459	94.6
11/27/02	4E10	Wearing	2	mid	31+040	2	704	BS	2377	119	144	6.4	2233	2459	96.7
11/27/02	4E10	Wearing	2	iwp	31+040	2	752	BS	2306	122	148	6.8	2158	2459	93.8
11/27/02	4E10	Wearing	2	owp	31+060	1	725	BS	2345	124	151	639	2194	2459	95.4
11/27/02	4E10	Wearing	2	mid	31+060	1	748	BS	2312	118	142	6.6	2170	2459	94.0
11/27/02	4E10	Wearing	2	iwp	31+060	1	751	BS	2307	125	152	7.1	2155	2459	93.8
11/27/02	4E10	Wearing	2	owp	31+060	2	775	BS	2274	120	145	6.8	2129	2459	92.5
11/27/02	4E10	Wearing	2	mid	31+060	2	740	BS	2323	124	151	6.9	2172	2459	94.5
11/27/02	4E10	Wearing	2	iwp	31+060	2	771	BS	2280	116	140	6.5	2140	2459	92.7
11/27/02	4E10	Wearing	2	owp	31+080	1	748	BS	2311	129	156	7.3	2155	2459	94.0
11/27/02	4E10	Wearing	2	mid	31+080	1	751	BS	2308	118	142	6.6	2166	2459	93.9
11/27/02	4E10	Wearing	2	iwp	31+080	1	738	BS	2330	115	138	6.3	2192	2459	94.8
11/27/02	4E10	Wearing	2	owp	31+080	2	797	BS	2245	116	140	6.6	2105	2459	91.3
11/27/02	4E10	Wearing	2	mid	31+080	2	728	BS	2341	123	149	6.8	2192	2459	95.2
11/27/02	4E10	Wearing	2	iwp	31+080	2	821	BS	2214	114	137	6.6	2077	2459	90.0
11/27/02	4E10	Wearing	2	owp	31+100	1	725	BS	2346	116	140	6.3	2206	2459	95.4
11/27/02	4E10	Wearing	2	mid	31+100	1	764	BS	2290	120	145	6.8	2145	2459	93.1
11/27/02	4E10	Wearing	2	iwp	31+100	1	757	BS	2299	120	145	6.7	2154	2459	93.5
11/27/02	4E10	Wearing	2	owp	31+100	2	719	BS	2354	126	153	7	2201	2459	95.7
11/27/02	4E10	Wearing	2	mid	31+100	2	151	BS	2308	120	145	6.7	2163	2459	93.9
11/27/02	4E10	Wearing	2	iwp	31+100	2	817	BS	2219	122	148	7.1	2071	2459	90.2

94.2
1.8
97.2
86.9
2%

Test	Layer	Test	Test Section	Test Location	Station	Lane	Nuclear Density Gauge Data								
							Density Counts	Test Depth	Wet Density	Moist. Counts	Moist.	Moist.,%	Dry Density	Max. Density	Compaction
11/26/02	4E10	Wearing	2	iwp	31+000	3	765	BS	2296	123	149	6.9	2147	2459	93.4
11/26/02	4E10	Wearing	2	owp	31+020	3	738	BS	2335	121	146	6.7	2189	2459	95.0
11/26/02	4E10	Wearing	2	mid	31+020	3	792	BS	2260	114	136	6.4	2124	2459	91.9
11/26/02	4E10	Wearing	2	iwp	31+020	3	737	BS	2336	122	147	6.7	2189	2459	95.0
11/26/02	4E10	Wearing	2	owp	31+040	3	752	BS	2315	119	143	6.6	2172	2459	94.1
11/26/02	4E10	Wearing	2	mid	31+040	3	824	BS	2219	116	139	6.7	2080	2459	90.2
11/26/02	4E10	Wearing	2	iwp	31+040	3	730	BS	2347	121	146	6.5	2201	2459	95.4
11/26/02	4E10	Wearing	2	owp	31+060	3	722	BS	2359	119	143	6.5	2216	2459	95.9
11/26/02	4E10	Wearing	2	mid	31+060	3	758	BS	2306	123	149	6.9	2157	2459	93.8
11/26/02	4E10	Wearing	2	iwp	31+060	3	715	BS	2369	124	150	6.8	2219	2459	96.3
11/26/02	4E10	Wearing	2	owp	31+080	3	727	BS	2351	120	145	6.6	2206	2459	95.6
11/26/02	4E10	Wearing	2	mid	31+080	3	739	BS	2334	116	139	6.3	2195	2459	94.9
11/26/02	4E10	Wearing	2	iwp	31+080	3	754	BS	2312	116	139	6.4	2173	2459	94.0
11/26/02	4E10	Wearing	2	owp	31+100	3	768	BS	2293	111	136	6.3	2157	2459	93.2
11/26/02	4E10	Wearing	2	mid	31+100	3	763	BS	2300	112	134	6.2	2166	2459	93.5
11/26/02	4E10	Wearing	2	iwp	31+100	3	734	BS	2341	115	138	6.3	2203	2459	95.2
11/27/02	4E10	Wearing	2	owp	30+960	1	736	BS	2329	128	156	7.2	2173	2459	94.7
11/27/02	4E10	Wearing	2	mid	30+960	1	753	BS	2305	119	144	6.6	2161	2459	93.7
11/27/02	4E10	Wearing	2	iwp	30+960	1	739	BS	2325	121	147	6.7	2178	2459	94.6
11/27/02	4E10	Wearing	2	owp	30+960	2	742	BS	2321	119	144	6.6	2177	2459	94.4
11/27/02	4E10	Wearing	2	mid	30+960	2	725	BS	2339	123	149	6.8	2190	2459	95.1
11/27/02	4E10	Wearing	2	iwp	30+960	2	781	BS	2266	118	147	6.7	2119	2459	92.2
11/27/02	4E10	Wearing	2	owp	30+980	1	746	BS	2315	126	153	7.1	2162	2459	94.1
11/27/02	4E10	Wearing	2	mid	30+980	1	741	BS	2322	124	151	6.9	2171	2459	94.4
11/27/02	4E10	Wearing	2	iwp	30+980	1	826	BS	2344	122	148	6.7	2196	2459	95.3
11/27/02	4E10	Wearing	2	owp	30+980	2	751	BS	2308	118	142	6.6	2166	2459	93.9
11/27/02	4E10	Wearing	2	mid	30+980	2	744	BS	2318	118	142	6.5	2176	2459	94.3
11/27/02	4E10	Wearing	2	iwp	30+980	2	749	BS	2311	115	138	6.4	2173	2459	94.0
11/27/02	4E10	Wearing	2	owp	31+000	1	745	BS	2316	121	147	6.7	2169	2459	94.2
11/27/02	4E10	Wearing	2	mid	31+000	1	729	BS	2339	125	152	6.9	2187	2459	95.1
11/27/02	4E10	Wearing	2	iwp	31+000	1	715	BS	2360	127	155	7	2205	2459	96.0
11/27/02	4E10	Wearing	2	owp	31+000	2	742	BS	2320	123	149	6.9	2171	2459	94.3
11/27/02	4E10	Wearing	2	mid	31+000	2	813	BS	2225	115	138	6.6	2087	2459	90.5
11/27/02	4E10	Wearing	2	iwp	31+000	2	819	BS	2217	113	135	6.5	2082	2459	90.2
11/27/02	4E10	Wearing	2	owp	31+020	1	725	BS	2345	121	147	6.7	2198	2459	95.4
11/27/02	4E10	Wearing	2	mid	31+020	1	741	BS	2322	119	144	6.6	2178	2459	94.4
11/27/02	4E10	Wearing	2	iwp	31+020	1	737	BS	2328	124	151	6.9	2177	2459	94.7
11/27/02	4E10	Wearing	2	owp	31+020	2	717	BS	2358	118	142	6.4	2216	2459	95.9
11/27/02	4E10	Wearing	2	mid	31+020	2	733	BS	2333	128	156	7.2	2177	2459	94.9
11/27/02	4E10	Wearing	2	iwp	31+020	2	785	BS	2261	121	147	6.9	2114	2459	91.9
11/27/02	4E10	Wearing	2	owp	31+040	1	725	BS	2345	130	159	7.3	2186	2459	95.4
11/27/02	4E10	Wearing	2	mid	31+040	1	740	BS	2323	126	153	7.1	2170	2459	94.5

GeoGauge Data

US-24 Perpetual Pavement Demo Project
Control Section 83053 Job Number 57994
Average GeoGauge Soil Stiffness and Elastic Modulus per Soil Layer

Statistical Analysis	Site 1								Site 2							
	Lane 1		Lane 2		Lane 3		Lane 4		Lane 1		Lane 2		Lane 3		Lane 4	
	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus	Soil Stiffness	Elastic Modulus
	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2	kip/in	kip/in^2
	Clay Subgrade								Sand Subgrade							
Average	**61.48**	**12.99**	**75.20**	**15.86**	**30.61**	**6.52**	**23.24**	**4.90**	**26.54**	**5.60**	**28.05**	**5.92**	**26.37**	**5.56**	**20.48**	**4.32**
Stdev.	36.47	7.68	31.40	6.62	5.55	1.06	6.77	1.43	4.47	0.94	4.83	1.02	4.04	0.85	3.02	0.64
Max.	116.10	24.48	129.05	27.21	38.49	8.12	31.98	6.75	33.80	7.13	34.41	7.26	33.65	7.10	24.40	5.15
Min.	24.72	5.21	30.68	6.47	22.84	5.14	13.25	2.80	21.55	4.54	20.75	4.38	21.37	4.50	15.04	3.17
C. of V.	59%	59%	42%	42%	18%	16%	29%	29%	17%	17%	17%	17%	15%	15%	15%	15%
	Sand Subbase								Sand Subbase							
Average	**48.03**	**10.13**	**51.84**	**10.94**	**40.53**	**8.55**	**45.63**	**9.62**	**18.26**	**3.87**	**24.80**	**5.17**	**36.43**	**7.68**	**43.72**	**9.19**
Stdev.	9.70	2.04	18.06	3.82	7.01	1.48	4.95	1.04	9.92	2.14	13.49	2.77	5.15	1.09	1.92	0.39
Max.	66.89	14.10	92.77	19.60	47.15	9.94	55.08	11.60	36.03	7.75	43.99	9.27	45.62	9.62	45.66	9.63
Min.	37.86	7.98	36.92	7.78	28.53	6.02	41.38	8.73	7.34	1.52	8.18	1.73	32.32	6.77	41.04	8.65
C. of V.	20%	20%	35%	35%	17%	17%	11%	11%	54%	55%	54%	54%	14%	14%	4%	4%
	Aggregate Base								Aggregate Base							
Average	**48.96**	**10.82**	**52.37**	**11.05**	**49.47**	**10.44**	**52.20**	**10.57**	**52.65**	**11.11**	**63.85**	**13.46**	**47.98**	**10.09**	**55.02**	**11.60**
Stdev.	6.89	0.86	6.26	1.33	11.13	2.34	4.69	1.86	10.99	2.32	12.78	2.69	17.23	3.62	7.22	1.52
Max.	58.05	12.24	59.94	12.67	68.14	14.37	58.22	12.27	71.22	15.02	78.34	16.52	68.75	14.50	68.23	14.39
Min.	35.19	9.87	43.62	9.20	37.63	7.94	46.08	6.81	41.68	8.79	47.79	10.08	17.97	3.79	44.98	9.49
C. of V.	14%	8%	12%	12%	22%	22%	9%	18%	21%	21%	20%	20%	36%	36%	13%	13%

Dynamic Cone Penetrometer Data

US-24 Perpetual Pavement Demo Project
Control Section 83053 Job Number 57994
Average Dynamic Cone Penetometer (DCP) Results per Soil Layer

Statistical Analysis	Site 1 Lane 1 CBR	Site 1 Lane 1 Elastic Deformation Modulus	Site 1 Lane 1 Total Depth	Site 1 Lane 2 CBR	Site 1 Lane 2 Elastic Deformation Modulus	Site 1 Lane 2 Total Depth	Site 1 Lane 3 CBR	Site 1 Lane 3 Elastic Deformation Modulus	Site 1 Lane 3 Total Depth	Site 1 Lane 4 CBR	Site 1 Lane 4 Elastic Deformation Modulus	Site 1 Lane 4 Total Depth
	%	psi	Inch	%	psi	Inch	%	psi	Inch	%	psi	Inch
Clay Subgrade												
Average	5	6956	22	5	6645	22	4	5914	22	3	5063	23
Stdev.	2	1631		2	1914		1	900		0	763	
Max.	7	8741		10	10922		5	7345		3	5626	
Min.	3	4822		3	4934		3	5123		2	3767	
C. of V.	33%	23%		47%	29%		22%	15%		16%	15%	
Sand Subbase												
Average	9	10493	14	12	11881	14	11	11446	14	14	13591	14
Stdev.	1	1162		3	2325		2	1559		2	1250	
Max.	11	12020		16	14624		14	13659		18	15111	
Min.	7	8366		5	7178		8	9650		11	11929	
C. of V.	15%	11%		30%	20%		21%	14%		17%	9%	
Aggregate Base												
Average	14	13383	12	15	13791	12	15	14060	12	20	17118	12
Stdev.	3	2159		3	1662		4	2134		4	2239	
Max.	19	16580		20	17006		21	17537		26	20266	
Min.	9	10375		12	12052		11	11469		14	13824	
C. of V.	25%	16%		19%	12%		24%	15%		21%	13%	

Statistical Analysis	Site 2 Lane 1 CBR	Site 2 Lane 1 Elastic Deformation Modulus	Site 2 Lane 1 Total Depth	Site 2 Lane 2 CBR	Site 2 Lane 2 Elastic Deformation Modulus	Site 2 Lane 2 Total Depth	Site 2 Lane 3 CBR	Site 2 Lane 3 Elastic Deformation Modulus	Site 2 Lane 3 Total Depth	Site 2 Lane 4 CBR	Site 2 Lane 4 Elastic Deformation Modulus	Site 2 Lane 4 Total Depth
	%	psi	Inch	%	psi	Inch	%	psi	Inch	%	psi	Inch
Sand Subgrade												
Average	4	6067	22	6	7888	22	7	8788	22	5	7176	22
Stdev.	1	1052		4	2981		2	1353		1	986	
Max.	6	8081		13	12800		9	10672		7	8502	
Min.	3	4610		3	5216		4	6160		4	5847	
C. of V.	24%	17%		61%	38%		22%	15%		22%	14%	
Sand Subbase												
Average	8	9032	14	15	13666	14	9	10194	14	16	14567	14
Stdev.	4	2845		6	3539		2	1271		2	1176	
Max.	14	13461		23	18423		11	11869		19	16527	
Min.	4	5720		6	8231		7	8712		12	12538	
C. of V.	50%	31%		39%	26%		20%	12%		13%	8%	
Aggregate Base												
Average	13	12762	12	16	14269	12	19	16088	12	21	17364	12
Stdev.	4	2211		6	3410		6	3715		7	3545	
Max.	18	15781		23	18658		31	22681		31	22637	
Min.	9	10581		9	10141		12	12148		14	13412	
C. of V.	28%	17%		36%	24%		34%	23%		32%	20%	

DYNAMIC CONE PENETROMETER (DCP) DATA

US-24 NORTHBOUND

CONTROL SECTION 82053 JOB NUMBER 57994A

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average DCP Index mm/blow	Average CBR %	Average Elastic Deformation Modulus(E) psi	Total Depth in.	Remarks
7/9/02	Clay	Subgrade	1	29+900	1	17	38	7	8518	23	
7/9/02	Clay	Subgrade	1	29+900	2	24	26	10	10922	22.6	
7/9/02	Sand/Clay	Subgrade	1	29+920	1	12	41	4	5942	25.2	
7/9/02	Clay	Subgrade	1	29+920	2	13	42	5	7172	22	
7/9/02	Clay	Subgrade	1	29+940	1	12	48	5	6562	22.8	
7/9/02	Sand/Clay	Subgrade	1	29+940	2	12	49	5	7031	22.2	
7/9/02	Clay	Subgrade	1	29+960	1	14	77	3	4543	22.4	
7/9/02	Clay	Subgrade	1	29+960	2	22	53	4	6078	22.8	
7/9/02	Clay	Subgrade	1	29+980	1	16	68	3	4822	22.4	
7/9/02	Sand	Subgrade	1	29+980	2	30	47	6	7499	22.6	
7/9/02	Sand	Subgrade	1	30+000	1	21	54	4	5803	22	
7/9/02	Clay	Subgrade	1	30+000	2	23	70	5	6779	22.8	
7/9/02	Sand	Subgrade	1	30+020	1	35	36	6	8137	22.8	
7/9/02	Clay	Subgrade	1	30+020	2	16	78	3	4934	22.2	
7/9/02	Clay	Subgrade	1	30+040	1	37	38	7	8741	21.7	
7/9/02	Clay	Subgrade	1	30+040	2	26	57	4	6033	22.6	
7/11/02	Clay	Subgrade	1	29+920	1	21	69	5	6513	21.9	Retest
7/11/02	Clay	Subgrade	1	29+940	1	33	46	7	8169	22.2	Retest
7/11/02	Sand Clay	Subgrade	1	29+960	1	17	72	3	4941	23.2	Retest
7/11/02	Clay	Subgrade	2	31+100	2	31	36	6	7775	22.4	
7/11/02	Sand	Subgrade	2	31+100	1	23	50	4	6173	21.7	
7/11/02	Sand	Subgrade	2	31+120	2	25	43	4	6608	22.2	
7/11/02	Sand	Subgrade	2	31+120	1	23	52	5	6596	22.2	
7/11/02	Sand	Subgrade	2	31+140	2	23	50	4	6197	22	
7/11/02	Clay	Subgrade	2	31+140	1	10	100	2	4014	23	
7/11/02	Clay	Subgrade	2	31+160	2	29	37	5	7467	22	
7/11/02	Clay	Subgrade	2	31+160	1	11	105	2	3902	22.6	
7/11/02	Sand	Subgrade	2	31+180	2	33	35	6	8019	21.9	
7/11/02	Sand	Subgrade	2	31+180	1	20	61	4	6222	21.7	
7/11/02	Sand	Subgrade	2	31+200	2	29	43	5	7311	22.4	
7/11/02	Sand	Subgrade	2	31+200	1	21	48	4	6325	21.7	
7/11/02	Sand	Subgrade	2	31+215	2	20	57	4	6190	22.4	
7/11/02	Sand	Subgrade	2	31+215	1	16	75	3	5378	21.9	
7/11/02	Sand	Subgrade	2	31+240	2	15	75	3	4747	21.9	
7/11/02	Sand	Subgrade	2	31+239	1	20	62	4	5736	22.4	

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average DCP Index mm/blow	Average CBR %	Average Elastic Deformation Modulus(E) psi	Total Depth in.	Remarks
7/12/02	Clay	Subgrade	1	29+920	2	22	56	4	6064	22.2	Retest
7/12/02	Clay	Subgrade	1	29+940	2	18	70	4	5754	21.7	Retest
7/12/02	Sand/Clay	Subgrade	1	29+960	2	17	70	3	5171	21.7	Retest
7/12/02	Sand	Subgrade	2	30+960	2	63	18	13	12800	21.7	
7/12/02	Sand	Subgrade	2	30+960	1	22	53	4	6152	21.5	
7/12/02	Sand	Subgrade	2	30+980	2	42	31	8	9414	22.4	
7/12/02	Sand	Subgrade	2	30+980	1	24	49	4	6301	22.2	
7/12/02	Sand	Subgrade	2	31+000	2	48	23	9	10558	21.7	
7/12/02	Sand	Subgrade	2	31+000	1	32	34	6	8081	21.7	
7/12/02	Sand	Subgrade	2	31+020	2	40	30	8	9161	22.2	
7/12/02	Sand	Subgrade	2	31+020	1	22	49	4	6267	21.7	
7/12/02	Sand	Subgrade	2	31+040	2	18	67	3	5448	22	
7/12/02	Sand	Subgrade	2	31+040	1	14	87	4	5342	22.6	
7/12/02	Sand Wet	Subgrade	2	31+060	2	17	71	3	5284	22	
7/12/02	Sand Wet	Subgrade	2	31+060	1	20	69	5	6551	22.4	
7/12/02	Sand	Subgrade	2	31+080	2	18	63	3	5216	22.2	
7/12/02	Sand	Subgrade	2	31+080	1	16	73	3	5230	21.9	
7/12/02	Sand	Subgrade	2	31+100	2	17	60	3	5220	21.9	
7/12/02	Sand	Subgrade	2	31+100	1	14	72	3	4610	21.9	
7/19/02	Sand	Subbase	1	29+900	2	45	16	15	14088	14	
7/19/02	Sand	Subbase	1	29+900	1	45	18	14	13498	14.6	
7/19/02	Sand	Subbase	1	29+920	2	47	16	16	14624	13.8	
7/19/02	Sand	Subbase	1	29+920	1	28	29	9	10062	13.8	
7/19/02	Sand	Subbase	1	29+940	2	39	20	12	12467	14	
7/19/02	Sand	Subbase	1	29+940	1	33	23	10	11341	13.8	
7/19/02	Sand	Subbase	1	29+960	2	44	19	15	13868	14.2	
7/19/02	Sand	Subbase	1	29+960	1	35	21	11	11572	14.4	
7/19/02	Sand	Subbase	1	29+980	2	36	20	11	11630	14.4	
7/19/02	Sand	Subbase	1	29+980	1	29	29	8	9838	14.6	
7/19/02	Sand	Subbase	1	30+000	2	30	28	9	10247	14.6	
7/19/02	Sand	Subbase	1	30+000	1	28	30	9	10180	14	
7/19/02	Sand	Subbase	1	30+020	2	40	18	13	12942	14	
7/19/02	Sand	Subbase	1	30+020	1	37	19	11	12020	14.2	
7/19/02	Sand	Subbase	1	30+040	2	38	19	12	12095	14.4	
7/19/02	Sand	Subbase	1	30+040	1	31	23	9	10563	14.6	
7/19/02	Sand	Subbase	1	30+040	2	8	40	5	7178	14	Retest using large hammer for info. only
7/19/02	Sand	Subbase	1	30+040	1	10	33	7	8366	14.4	Retest using large hammer for info. only
7/29/02	Sand	Subbase	2	30+960	1	13	52	4	5720	14	Gravely sand
7/29/02	Sand	Subbase	2	30+960	2	38	27	13	12437	14.4	Gravely sand
7/29/02	Sand	Subbase	2	30+980	1	34	23	11	11452	14.2	Gravely sand
7/29/02	Sand	Subbase	2	30+980	2	34	23	11	11438	14	Gravely sand
7/29/02	Sand	Subbase	2	31+000	1	42	18	14	13461	14	Gravely sand
7/29/02	Sand	Subbase	2	31+000	2	66	14	23	18423	13.8	Gravely sand

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average DCP Index mm/blow	Average CBR %	Average Elastic Deformation Modulus(E) psi	Total Depth in.	Remarks
7/29/02	Sand	Subbase	2	31+020	1	35	23	**11**	**11497**	14.4	Gravely sand
7/29/02	Sand	Subbase	2	31+020	2	56	12	**19**	**16619**	13.8	Gravely sand
7/29/02	Sand	Subbase	2	31+040	1	19	45	**5**	**7184**	15	Gravely sand
7/29/02	Sand	Subbase	2	31+040	2	55	13	**18**	**16285**	13.8	Gravely sand
7/29/02	Sand	Subbase	2	31+060	1	27	31	**8**	**9443**	14.4	Gravely sand
7/29/02	Sand	Subbase	2	31+060	2	52	14	**17**	**15441**	14	Gravely sand
7/29/02	Sand	Subbase	2	31+080	1	16	47	**4**	**6492**	15.2	Gravely sand
7/29/02	Sand	Subbase	2	31+080	2	22	35	**6**	**8231**	14.6	Gravely sand
7/29/02	Sand	Subbase	2	31+100	1	17	46	**5**	**7010**	13.8	Gravely sand
7/29/02	Sand	Subbase	2	31+100	2	29	27	**9**	**10457**	13.8	Gravely sand
8/8/02	Aggregate	Base	2	30+960	2	28	26	**10**	**11076**	12.2	
8/8/02	Aggregate	Base	2	30+960	1	28	25	**10**	**11206**	12.6	
8/8/02	Aggregate	Base	2	30+980	2	34	18	**13**	**13056**	11.8	
8/8/02	Aggregate	Base	2	30+980	1	26	24	**9**	**10581**	12	
8/8/02	Aggregate	Base	2	31+000	2	24	30	**9**	**10141**	11.8	
8/8/02	Aggregate	Base	2	31+000	1	26	30	**10**	**10607**	12	
8/8/02	Aggregate	Base	2	31+020	2	28	23	**10**	**10836**	12.4	
8/8/02	Aggregate	Base	2	31+020	1	28	25	**10**	**10909**	12.2	
8/8/02	Aggregate	Base	2	31+040	2	46	14	**18**	**15732**	12	
8/8/02	Aggregate	Base	2	31+040	1	35	20	**13**	**13085**	11.8	
8/8/02	Aggregate	Base	2	31+060	2	58	11	**23**	**18658**	11	
8/8/02	Aggregate	Base	2	31+060	1	40	17	**16**	**14812**	12	
8/8/02	Aggregate	Base	2	31+080	2	50	16	**20**	**16702**	11.8	
8/8/02	Aggregate	Base	2	31+080	1	50	16	**18**	**15781**	12.6	
8/8/02	Aggregate	Base	2	31+100	2	54	11	**21**	**17954**	12	
8/8/02	Aggregate	Base	2	31+100	1	42	15	**17**	**15117**	11.8	
8/12/02	Aggregate	Base	1	29+900	2	36	17	**13**	**13236**	12	
8/12/02	Aggregate	Base	1	29+900	1	25	25	**9**	**10375**	12	
8/12/02	Aggregate	Base	1	29+920	2	44	14	**17**	**15551**	11.8	
8/12/02	Aggregate	Base	1	29+920	1	30	23	**10**	**11186**	12.2	
8/12/02	Aggregate	Base	1	29+940	2	34	18	**13**	**12982**	12.2	
8/12/02	Aggregate	Base	1	29+940	1	35	17	**13**	**12942**	12.6	
8/12/02	Aggregate	Base	1	29+960	2	51	12	**20**	**17006**	12.2	
8/12/02	Aggregate	Base	1	29+960	1	46	15	**19**	**16580**	12	
8/12/02	Aggregate	Base	1	29+980	2	33	19	**13**	**12684**	12.2	
8/12/02	Aggregate	Base	1	29+980	1	34	18	**13**	**13020**	12.2	
8/12/02	Aggregate	Base	1	30+000	2	35	19	**13**	**12964**	11.8	
8/12/02	Aggregate	Base	1	30+000	1	36	19	**14**	**13648**	11.8	
8/12/02	Aggregate	Base	1	30+020	2	32	20	**12**	**12052**	12.2	
8/12/02	Aggregate	Base	1	30+020	1	45	14	**18**	**16221**	11.8	
8/12/02	Aggregate	Base	1	30+040	2	39	19	**15**	**13849**	12.6	
8/12/02	Aggregate	Base	1	30+040	1	32	16	**13**	**13090**	12	
10/21/02	Clay	Subgrade	1	29+960	3	14	40	**5**	**7345**	22.2	

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average DCP Index mm/blow	Average CBR %	Average Elastic Deformation Modulus(E) psi	Total Depth in.	Remarks
10/21/02	Clay	Subgrade	1	29+960	4	10	61	3	5186	22.2	
10/21/02	Clay	Subgrade	1	29+980	3	12	51	4	5919	23.2	
10/21/02	Clay	Subgrade	1	29+980	4	11	55	3	5621	22.8	
10/21/02	Clay	Subgrade	1	30+000	3	9	70	3	5166	22.8	
10/21/02	Clay	Subgrade	1	30+000	4	8	78	3	5114	22.4	
10/21/02	Clay	Subgrade	1	30+020	3	11	54	4	6017	22	
10/21/02	Clay	Subgrade	1	30+020	4	11	56	3	5626	23	
10/21/02	Clay	Subgrade	1	30+040	3	8	75	3	5123	21.9	
10/21/02	Clay	Subgrade	1	30+040	4	7	98	2	3767	24.4	
10/23/02	Sand	Subgrade	2	30+960	3	49	22	9	10672	22.2	
10/23/02	Sand	Subgrade	2	30+960	4	31	43	6	7694	22	
10/23/02	Sand	Subgrade	2	30+980	3	37	31	7	8829	21.7	
10/23/02	Sand	Subgrade	2	30+980	4	29	41	6	7419	21.7	
10/23/02	Sand	Subgrade	2	31+000	3	35	32	7	8515	20.1	
10/23/02	Sand	Subgrade	2	31+000	4	28	45	5	7116	22.6	
10/23/02	Sand	Subgrade	2	31+020	3	43	28	8	9587	22.4	
10/23/02	Sand	Subgrade	2	31+020	4	32	31	6	8287	21.9	
10/23/02	Sand	Subgrade	2	31+040	3	38	29	7	8782	22.2	
10/23/02	Sand	Subgrade	2	31+040	4	34	34	7	8502	22	
10/23/02	Sand	Subgrade	2	31+060	3	42	25	8	9781	22	
10/23/02	Sand	Subgrade	2	31+060	4	25	47	4	6471	22.4	
10/23/02	Sand	Subgrade	2	31+080	3	22	50	4	6160	22.2	
10/23/02	Sand	Subgrade	2	31+080	4	20	56	4	6072	21.7	
10/23/02	Sand	Subgrade	2	31+100	3	31	37	6	7977	22.2	
10/23/02	Sand	Subgrade	2	31+100	4	20	56	4	5847	21.7	
10/24/02	Sand	Subbase	1	29+900	3	25	30	9	9650	14.2	
10/24/02	Sand	Subbase	1	29+900	4	38	20	12	12279	14.2	
10/24/02	Sand	Subbase	1	29+920	3	42	19	14	13349	14.4	
10/24/02	Sand	Subbase	1	29+920	4	35	21	11	11929	13.8	
10/24/02	Sand	Subbase	1	29+940	3	30	24	10	11109	14.2	
10/24/02	Sand	Subbase	1	29+940	4	41	21	13	13147	14	
10/24/02	Sand	Subbase	1	29+960	3	42	18	14	13659	14	
10/24/02	Sand	Subbase	1	29+960	4	44	16	15	14241	13.8	
10/24/02	Sand	Subbase	1	29+980	3	24	29	8	9688	13.8	
10/24/02	Sand	Subbase	1	29+980	4	44	17	18	14241	14	
10/24/02	Sand	Subbase	1	30+000	3	28	28	9	10279	14.6	
10/24/02	Sand	Subbase	1	30+000	4	49	15	16	15099	14.2	
10/24/02	Sand	Subbase	1	30+020	3	34	21	11	11550	14.6	
10/24/02	Sand	Subbase	1	30+020	4	48	14	16	15111	13.8	
10/24/02	Sand	Subbase	1	30+040	3	38	21	12	12281	14.6	
10/24/02	Sand	Subbase	1	30+040	4	40	20	13	12680	14.2	
10/26/02	Sand	Subbase	2	30+960	3	27	29	9	9798	14.2	
10/26/02	Sand	Subbase	2	30+960	4	42	17	14	13479	14	

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average DCP Index mm/blow	Average CBR %	Average Elastic Deformation Modulus(E) psi	Total Depth in.	Remarks
10/26/02	Sand	Subbase	2	30+980	3	22	32	7	8838	13.8	
10/26/02	Sand	Subbase	2	30+980	4	38	18	12	12538	14	
10/26/02	Sand	Subbase	2	31+000	3	30	25	10	10694	14	
10/26/02	Sand	Subbase	2	31+000	4	52	16	17	15010	12.4	
10/26/02	Sand	Subbase	2	31+020	3	33	23	10	11087	14.6	
10/26/02	Sand	Subbase	2	31+020	4	46	15	15	14477	14	
10/26/02	Sand	Subbase	2	31+040	3	22	31	7	8712	14	
10/26/02	Sand	Subbase	2	31+040	4	58	13	19	16527	14.6	
10/26/02	Sand	Subbase	2	31+060	3	23	31	7	9004	14	
10/26/02	Sand	Subbase	2	31+060	4	49	15	15	14572	14.2	
10/26/02	Sand	Subbase	2	31+080	3	33	23	11	11553	14	
10/26/02	Sand	Subbase	2	31+080	4	49	14	16	15068	13.8	
10/26/02	Sand	Subbase	2	31+100	3	33	22	11	11869	13.8	
10/26/02	Sand	Subbase	2	31+100	4	49	16	16	14865	14.2	
10/30/02	Aggregate	Base	1	29+900	3	53	12	21	17537	12.2	
10/30/02	Aggregate	Base	1	29+900	4	64	11	26	20266	12.4	
10/30/02	Aggregate	Base	1	29+920	3	32	21	13	12539	11.8	
10/30/02	Aggregate	Base	1	29+920	4	54	11	23	18758	12	
10/30/02	Aggregate	Base	1	29+940	3	27	25	11	11469	12.6	
10/30/02	Aggregate	Base	1	29+940	4	55	11	22	18232	12.2	
10/30/02	Aggregate	Base	1	29+960	3	48	14	20	16786	12.4	
10/30/02	Aggregate	Base	1	29+960	4	55	11	22	18224	12.2	
10/30/02	Aggregate	Base	1	29+980	3	32	17	13	12858	11.8	
10/30/02	Aggregate	Base	1	29+980	4	47	12	21	17456	12	
10/30/02	Aggregate	Base	1	30+000	3	30	20	13	12726	11.8	
10/30/02	Aggregate	Base	1	30+000	4	37	16	15	14436	12	
10/30/02	Aggregate	Base	1	30+020	3	43	15	15	14320	11.4	
10/30/02	Aggregate	Base	1	30+020	4	37	18	14	13824	11.8	
10/30/02	Aggregate	Base	1	30+040	3	39	16	15	14245	12.2	
10/30/02	Aggregate	Base	1	30+040	4	43	13	17	15746	12.4	
11/4/02	Aggregate	Base	2	30+960	3	68	10	25	19790	13.2	
11/4/02	Aggregate	Base	2	30+960	4	73	9	31	22375	12	
11/4/02	Aggregate	Base	2	30+980	3	31	24	12	12148	11.8	
11/4/02	Aggregate	Base	2	30+980	4	74	10	31	22637	11.2	
11/4/02	Aggregate	Base	2	31+000	3	68	8	31	22681	11.8	
11/4/02	Aggregate	Base	2	31+000	4	58	15	24	18783	11.2	
11/4/02	Aggregate	Base	2	31+020	3	49	11	21	17745	11.8	
11/4/02	Aggregate	Base	2	31+020	4	44	20	19	16179	12	
11/4/02	Aggregate	Base	2	31+040	3	42	15	18	15551	11.8	
11/4/02	Aggregate	Base	2	31+040	4	45	19	19	16036	11.8	
11/4/02	Aggregate	Base	2	31+060	3	31	28	13	12656	11.8	
11/4/02	Aggregate	Base	2	31+060	4	44	17	17	15261	12.4	
11/4/02	Aggregate	Base	2	31+080	3	36	25	15	13391	12.6	

Test Date	Layer Material	Test Surface	Test Site	Station m	Lane	Total Blows	Average			Total Depth in.	Remarks
							DCP Index mm/blow	CBR %	Elastic Deformation Modulus(E) psi		
11/4/02	Aggregate	Base	2	31+080	4	37	20	14	13412	12.4	
11/4/02	Aggregate	Base	2	31+100	3	41	16	16	14738	12	
11/4/02	Aggregate	Base	2	31+100	4	38	19	15	14230	11.8	

Falling Weight Deflectometer Data

IKUAB FWD FILE : 112702.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Site 1
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: :
H : Site 1 Lane 1 4E10 wearing
H :

H :

IDate Created : 27-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance	Imp	Load	D0	D1	D2	D3	D4	D5	D6	D7	D8	Air	Pave	Station	Test	Test	Rdwy.	Test
J m	Num	lbf	mils	mils	mils	mils	mils	mils	mils	mils	mils	øF	øF		Site	Lane	Mtrl	Time
D 0	2	9000	7.11	6.10	6.10	6.47	6.07	5.50	4.87	3.86	2.24	37.0	56.0	29+900	1	1	FLEXWEAR	17:04
D 0	3	9000	7.11	6.13	6.10	6.47	6.02	5.49	4.89	3.88	2.25	37.0	56.0	29+900	1	1	FLEXWEAR	17:04
D 0	4	9000	7.16	6.14	6.17	6.55	6.10	5.53	4.92	3.90	2.27	37.0	56.0	29+900	1	1	FLEXWEAR	17:05
D 20	2	9000	6.08	5.18	5.29	5.56	5.21	4.84	4.36	3.56	2.14	38.0	59.0	29+920	1	1	FLEXWEAR	17:06
D 20	3	9000	6.02	5.15	5.22	5.49	5.15	4.78	4.33	3.53	2.14	38.0	59.0	29+920	1	1	FLEXWEAR	17:06
D 20	4	9000	5.99	5.17	5.24	5.47	5.17	4.80	4.31	3.52	2.13	38.0	59.0	29+920	1	1	FLEXWEAR	17:07
D 40	2	9000	6.41	5.48	5.52	5.74	5.37	4.96	4.47	3.64	2.17	36.0	60.0	29+940	1	1	FLEXWEAR	17:08
D 40	3	9000	6.42	5.45	5.49	5.74	5.37	4.96	4.44	3.61	2.18	36.0	60.0	29+940	1	1	FLEXWEAR	17:08
D 40	4	9000	6.34	5.40	5.40	5.66	5.33	4.92	4.43	3.56	2.13	36.0	60.0	29+940	1	1	FLEXWEAR	17:09
D 60	2	9000	6.46	5.53	5.64	5.90	5.53	5.08	4.55	3.62	2.16	37.0	56.0	29+960	1	1	FLEXWEAR	17:10
D 60	3	9000	6.48	5.55	5.62	5.92	5.55	5.09	4.57	3.67	2.17	37.0	56.0	29+960	1	1	FLEXWEAR	17:10
D 60	4	9000	6.46	5.52	5.60	5.90	5.52	5.07	4.54	3.64	2.17	37.0	56.0	29+960	1	1	FLEXWEAR	17:11
D 80	2	9000	6.13	5.30	5.30	5.60	5.26	4.85	4.32	3.53	2.14	37.0	54.0	29+980	1	1	FLEXWEAR	17:14
D 80	3	9000	6.12	5.22	5.25	5.56	5.18	4.77	4.32	3.53	2.17	37.0	54.0	29+980	1	1	FLEXWEAR	17:14
D 80	4	9000	6.13	5.22	5.26	5.53	5.18	4.77	4.32	3.53	2.14	37.0	54.0	29+980	1	1	FLEXWEAR	17:14
D 100	2	9000	8.05	6.95	7.03	7.41	6.91	6.31	5.57	4.29	2.41	37.0	54.0	30+000	1	1	FLEXWEAR	17:16
D 100	3	9000	8.00	6.91	6.98	7.36	6.87	6.27	5.56	4.28	2.40	37.0	54.0	30+000	1	1	FLEXWEAR	17:16
D 100	4	9000	7.95	6.90	6.97	7.32	6.83	6.23	5.52	4.28	2.40	37.0	54.0	30+000	1	1	FLEXWEAR	17:16
D 120	2	9000	6.48	5.54	5.54	5.84	5.51	5.05	4.49	3.63	2.17	37.0	59.0	30+020	1	1	FLEXWEAR	17:18
D 120	3	9000	6.41	5.52	5.56	5.81	5.48	5.03	4.50	3.64	2.14	37.0	59.0	30+020	1	1	FLEXWEAR	17:18
D 120	4	9000	6.43	5.50	5.54	5.79	5.46	5.02	4.48	3.63	2.17	37.0	59.0	30+020	1	1	FLEXWEAR	17:18
D 140	2	9000	7.08	6.04	6.00	6.41	5.96	5.44	4.80	3.79	2.13	38.0	60.0	30+040	1	1	FLEXWEAR	17:19
D 140	3	9000	7.07	6.02	5.98	6.39	5.94	5.38	4.82	3.80	2.14	38.0	60.0	30+040	1	1	FLEXWEAR	17:20
D 140	4	9000	7.08	5.99	5.99	6.37	5.92	5.39	4.80	3.79	2.13	38.0	60.0	30+040	1	1	FLEXWEAR	17:20

s1l2e4.fwd

IKUAB FWD FILE : 112702.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Site 1
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: :
H : Site 1 Lane 2 4E10 wearing
H :

H :

IDate Created : 27-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance	Imp	Load	D0	D1	D2	D3	D4	D5	D6	D7	D8	Air	Pave	Station	Test	Test	Rdwy.	Test
J m	Num	lbf	mils	mils	mils	mils	mils	mils	mils	mils	mils	øF	øF		Site	Lane	Mtrl	Time
D 0	2	9000	8.55	7.11	7.00	7.64	6.96	6.14	5.27	3.91	2.10	37.0	60.0	29+900	1	2	FLEXWEAR	17:23
D 0	3	9000	8.50	7.03	6.96	7.60	6.88	6.13	5.26	3.91	2.10	37.0	60.0	29+900	1	2	FLEXWEAR	17:24
D 0	4	9000	8.45	7.02	6.94	7.51	6.87	6.08	5.25	3.90	2.10	37.0	60.0	29+900	1	2	FLEXWEAR	17:24
D 20	2	9000	8.79	7.21	7.21	7.89	7.21	6.37	5.51	4.11	2.19	38.0	61.0	29+920	1	2	FLEXWEAR	17:25
D 20	3	9000	8.65	7.12	7.08	7.80	7.16	6.29	5.47	4.08	2.17	38.0	61.0	29+920	1	2	FLEXWEAR	17:26
D 20	4	9000	8.64	7.10	7.10	7.74	7.10	6.27	5.45	4.05	2.14	38.0	61.0	29+920	1	2	FLEXWEAR	17:26
D 40	2	9000	8.79	7.21	7.18	7.85	7.14	6.31	5.41	3.98	2.07	37.0	62.0	29+940	1	2	FLEXWEAR	17:27
D 40	3	9000	8.69	7.07	7.07	7.75	7.07	6.21	5.31	3.88	2.04	37.0	62.0	29+940	1	2	FLEXWEAR	17:28
D 40	4	9000	8.70	7.12	7.08	7.72	7.08	6.26	5.39	3.95	2.08	37.0	62.0	29+940	1	2	FLEXWEAR	17:28
D 60	2	9000	7.68	6.33	6.33	6.89	6.37	5.73	4.99	3.79	2.03	37.0	61.0	29+960	1	2	FLEXWEAR	17:29
D 60	3	9000	7.66	6.27	6.34	6.87	6.34	5.70	5.00	3.80	2.07	37.0	61.0	29+960	1	2	FLEXWEAR	17:29
D 60	4	9000	7.67	6.32	6.36	6.88	6.39	5.72	5.01	3.80	2.04	37.0	61.0	29+960	1	2	FLEXWEAR	17:29
D 80	2	9000	6.98	5.82	5.82	6.24	5.78	5.22	4.58	3.60	1.99	37.0	61.0	29+980	1	2	FLEXWEAR	17:31
D 80	3	9000	6.95	5.78	5.82	6.20	5.71	5.22	4.62	3.57	2.00	37.0	61.0	29+980	1	2	FLEXWEAR	17:31
D 80	4	9000	6.93	5.77	5.77	6.19	5.69	5.17	4.57	3.56	1.99	37.0	61.0	29+980	1	2	FLEXWEAR	17:31
D 100	2	9000	8.02	6.85	6.85	7.30	6.74	6.13	5.38	4.18	2.29	38.0	59.0	30+000	1	2	FLEXWEAR	17:33
D 100	3	9000	8.02	6.86	6.86	7.23	6.74	6.14	5.42	4.18	2.33	38.0	59.0	30+000	1	2	FLEXWEAR	17:33
D 100	4	9000	7.98	6.82	6.85	7.26	6.74	6.14	5.38	4.18	2.29	38.0	59.0	30+000	1	2	FLEXWEAR	17:33
D 120	2	9000	8.12	6.77	6.81	7.34	6.81	6.06	5.30	3.98	2.14	38.0	60.0	30+020	1	2	FLEXWEAR	17:34
D 120	3	9000	8.07	6.72	6.76	7.25	6.65	5.97	5.25	3.98	2.14	38.0	60.0	30+020	1	2	FLEXWEAR	17:35
D 120	4	9000	8.06	6.74	6.74	7.23	6.70	5.98	5.27	4.02	2.18	38.0	60.0	30+020	1	2	FLEXWEAR	17:35
D 140	2	9000	8.52	7.12	7.16	7.65	7.05	6.29	5.43	4.11	2.18	38.0	62.0	30+040	1	2	FLEXWEAR	17:36
D 140	3	9000	8.53	7.13	7.17	7.66	7.01	6.30	5.43	4.11	2.22	38.0	62.0	30+040	1	2	FLEXWEAR	17:36
D 140	4	9000	8.51	7.11	7.14	7.63	6.99	6.24	5.48	4.12	2.23	38.0	62.0	30+040	1	2	FLEXWEAR	17:37

IKUAB FWD FILE : 112602.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Sites 1
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing 4E10
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: : Site 1 Lane 3 4E10 wearing
H :
H :

H :

IDate Created : 26-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance	Imp	Load	D0	D1	D2	D3	D4	D5	D6	D7	D8	Air	Pave	Station	Test	Test	Rdwy.	Test
J m	Num	lbf	mils	mils	mils	mils	mils	mils	mils	mils	mils	øF	øF		Site	Lane	Mtrl	Time
D 0	2	9000	7.09	6.24	6.20	6.61	6.20	5.64	5.03	3.98	2.29	40.0	47.0	29+900	1	3	FLEXWEAR	15:16
D 0	3	9000	7.06	6.24	6.20	6.58	6.20	5.64	5.04	3.98	2.29	40.0	47.0	29+900	1	3	FLEXWEAR	15:16
D 0	4	9000	7.11	6.25	6.21	6.59	6.21	5.64	5.04	3.97	2.31	40.0	47.0	29+900	1	3	FLEXWEAR	15:16
D 20	2	9000	6.37	5.73	5.77	5.96	5.69	5.32	4.75	3.89	2.38	41.0	48.0	29+920	1	3	FLEXWEAR	15:18
D 20	3	9000	6.31	5.67	5.67	5.90	5.61	5.22	4.70	3.84	2.37	41.0	48.0	29+920	1	3	FLEXWEAR	15:18
D 20	4	9000	6.34	5.63	5.70	5.89	5.59	5.21	4.73	3.87	2.40	41.0	48.0	29+920	1	3	FLEXWEAR	15:18
D 40	2	9000	6.44	5.80	5.84	6.03	5.73	5.35	4.79	3.92	2.41	40.0	48.0	29+940	1	3	FLEXWEAR	15:19
D 40	3	9000	6.43	5.79	5.83	6.06	5.75	5.34	4.82	3.95	2.45	40.0	48.0	29+940	1	3	FLEXWEAR	15:20
D 40	4	9000	6.38	5.71	5.74	5.97	5.67	5.26	4.77	3.90	2.40	40.0	48.0	29+940	1	3	FLEXWEAR	15:20
D 60	2	9000	6.80	6.16	6.08	6.34	6.08	5.67	5.07	4.12	2.42	40.0	47.0	29+960	1	3	FLEXWEAR	15:21
D 60	3	9000	6.78	6.14	6.10	6.36	6.02	5.61	5.07	4.10	2.41	40.0	47.0	29+960	1	3	FLEXWEAR	15:21
D 60	4	9000	6.76	6.12	6.08	6.30	6.01	5.59	5.07	4.12	2.42	40.0	47.0	29+960	1	3	FLEXWEAR	15:21
D 80	2	9000	6.29	5.66	5.62	5.92	5.69	5.28	4.75	3.89	2.41	39.0	48.0	29+980	1	3	FLEXWEAR	15:23
D 80	3	9000	6.32	5.65	5.65	5.91	5.65	5.27	4.78	3.95	2.45	39.0	48.0	29+980	1	3	FLEXWEAR	15:23
D 80	4	9000	6.27	5.66	5.62	5.88	5.62	5.24	4.75	3.92	2.41	39.0	48.0	29+980	1	3	FLEXWEAR	15:23
D 100	2	9000	6.62	5.98	5.94	6.17	5.94	5.49	4.92	4.05	2.46	39.0	47.0	30+000	1	3	FLEXWEAR	15:25
D 100	3	9000	6.66	5.98	5.98	6.21	5.90	5.49	4.96	4.04	2.50	39.0	47.0	30+000	1	3	FLEXWEAR	15:25
D 100	4	9000	6.56	5.96	5.88	6.15	5.85	5.43	4.91	4.00	2.49	39.0	47.0	30+000	1	3	FLEXWEAR	15:25
D 120	2	9000	6.48	5.80	5.88	6.11	5.88	5.43	4.86	3.99	2.41	39.0	47.0	30+020	1	3	FLEXWEAR	15:28
D 120	3	9000	6.48	5.76	5.87	6.06	5.76	5.35	4.82	3.95	2.37	39.0	47.0	30+020	1	3	FLEXWEAR	15:28
D 120	4	9000	6.47	5.75	5.83	6.06	5.75	5.34	4.82	3.95	2.41	39.0	47.0	30+020	1	3	FLEXWEAR	15:28
D 140	2	9000	7.53	6.66	6.74	7.08	6.74	6.13	5.45	4.35	2.50	40.0	47.0	30+040	1	3	FLEXWEAR	15:32
D 140	3	9000	7.56	6.65	6.73	7.07	6.69	6.13	5.48	4.35	2.53	40.0	47.0	30+040	1	3	FLEXWEAR	15:32
D 140	4	9000	7.53	6.67	6.75	7.08	6.71	6.14	5.49	4.40	2.54	40.0	47.0	30+040	1	3	FLEXWEAR	15:32

IKUAB FWD FILE : 112402.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Site 1
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : wearing
HEnvironment: : partly sunny,cool
HOperator: : Kurt S. Bancroft
HComments: :
H : Site 1 Lane 4 4E10 wearing
H :

H :

IDate Created : 24-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D 0	2	9000	8.46	7.18	7.33	7.67	7.10	6.39	5.60	4.33	2.37	45.0	60.0	29+900	1	4	FLEXWEAR	16:39
D 0	3	9000	8.40	7.16	7.31	7.61	7.08	6.40	5.62	4.34	2.37	45.0	60.0	29+900	1	4	FLEXWEAR	16:40
D 0	4	9000	8.42	7.14	7.33	7.59	7.07	6.35	5.64	4.33	2.37	45.0	60.0	29+900	1	4	FLEXWEAR	16:40
D 20	2	9000	9.30	7.80	8.07	8.36	7.72	6.89	6.07	4.59	2.53	45.0	63.0	29+920	1	4	FLEXWEAR	16:41
D 20	3	9000	9.22	7.75	7.98	8.31	7.67	6.88	6.02	4.62	2.52	45.0	63.0	29+920	1	4	FLEXWEAR	16:41
D 20	4	9000	9.22	7.71	7.94	8.28	7.64	6.85	6.02	4.59	2.52	45.0	63.0	29+920	1	4	FLEXWEAR	16:42
D 40	2	9000	9.15	7.75	7.91	8.28	7.72	6.96	6.06	4.59	2.52	45.0	64.0	29+940	1	4	FLEXWEAR	16:43
D 40	3	9000	9.08	7.68	7.83	8.24	7.60	6.86	6.02	4.59	2.49	45.0	64.0	29+940	1	4	FLEXWEAR	16:43
D 40	4	9000	9.06	7.66	7.81	8.22	7.62	6.87	6.04	4.56	2.49	45.0	64.0	29+940	1	4	FLEXWEAR	16:44
D 60	2	9000	8.74	7.43	7.57	7.91	7.43	6.63	5.80	4.45	2.45	45.0	62.0	29+960	1	4	FLEXWEAR	16:45
D 60	3	9000	8.74	7.39	7.53	7.91	7.35	6.63	5.84	4.45	2.49	45.0	62.0	29+960	1	4	FLEXWEAR	16:45
D 60	4	9000	8.69	7.38	7.53	7.91	7.35	6.63	5.80	4.45	2.45	45.0	62.0	29+960	1	4	FLEXWEAR	16:46
D 80	2	9000	9.97	8.31	8.46	8.99	8.31	7.44	6.48	4.93	2.62	45.0	64.0	29+980	1	4	FLEXWEAR	16:48
D 80	3	9000	9.88	8.19	8.34	8.87	8.19	7.36	6.45	4.91	2.61	45.0	64.0	29+980	1	4	FLEXWEAR	16:48
D 80	4	9000	9.88	8.22	8.34	8.87	8.19	7.36	6.41	4.91	2.65	45.0	64.0	29+980	1	4	FLEXWEAR	16:48
D 100	2	9000	9.72	8.32	8.36	8.77	8.16	7.34	6.43	4.96	2.69	45.0	64.0	30+000	1	4	FLEXWEAR	16:49
D 100	3	9000	9.72	8.27	8.31	8.74	8.16	7.33	6.45	4.90	2.70	45.0	64.0	30+000	1	4	FLEXWEAR	16:50
D 100	4	9000	9.71	8.27	8.27	8.73	8.12	7.28	6.45	4.93	2.70	45.0	64.0	30+000	1	4	FLEXWEAR	16:50
D 120	2	9000	9.26	7.70	7.82	8.23	7.66	6.88	6.04	4.60	2.53	46.0	66.0	30+020	1	4	FLEXWEAR	16:51
D 120	3	9000	9.22	7.67	7.78	8.19	7.59	6.84	6.01	4.61	2.53	46.0	66.0	30+020	1	4	FLEXWEAR	16:51
D 120	4	9000	9.24	7.68	7.76	8.17	7.57	6.82	6.02	4.62	2.58	46.0	66.0	30+020	1	4	FLEXWEAR	16:52
D 140	2	9000	9.85	8.17	8.32	8.89	8.28	7.45	6.50	4.98	2.66	46.0	67.0	30+040	1	4	FLEXWEAR	16:53
D 140	3	9000	9.76	8.13	8.27	8.80	8.16	7.37	6.49	4.94	2.66	46.0	67.0	30+040	1	4	FLEXWEAR	16:53
D 140	4	9000	9.73	8.10	8.21	8.82	8.14	7.38	6.46	4.94	2.67	46.0	67.0	30+040	1	4	FLEXWEAR	16:54

IKUAB FWD FILE : 112602.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Sites 1
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing 4E10
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: : Site 1 4 4E10 wearing
H :
H :

H :

IDate Created : 26-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance J m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D 0	2	9000	6.52	5.84	5.92	6.11	5.84	5.31	4.79	3.92	2.30	38.0	45.0	29+900	1	4	FLEXWEAR	14:59
D 0	3	9000	6.50	5.82	5.90	6.02	5.71	5.30	4.77	3.88	2.33	38.0	45.0	29+900	1	4	FLEXWEAR	14:59
D 0	4	9000	6.52	5.81	5.88	6.03	5.73	5.28	4.76	3.86	2.32	38.0	45.0	29+900	1	4	FLEXWEAR	14:59
D 20	2	9000	6.69	6.05	6.09	6.31	6.01	5.53	4.96	4.02	2.44	38.0	46.0	29+920	1	4	FLEXWEAR	15:01
D 20	3	9000	6.75	6.03	6.03	6.29	6.00	5.51	4.95	4.04	2.44	38.0	46.0	29+920	1	4	FLEXWEAR	15:01
D 20	4	9000	6.67	6.00	6.03	6.25	5.92	5.51	4.95	4.01	2.47	38.0	46.0	29+920	1	4	FLEXWEAR	15:01
D 40	2	9000	6.48	5.76	5.84	6.03	5.76	5.32	4.79	3.93	2.36	40.0	46.0	29+940	1	4	FLEXWEAR	15:02
D 40	3	9000	6.50	5.82	5.86	6.05	5.75	5.38	4.85	3.94	2.41	40.0	46.0	29+940	1	4	FLEXWEAR	15:02
D 40	4	9000	6.51	5.79	5.87	6.10	5.79	5.34	4.86	3.95	2.37	40.0	46.0	29+940	1	4	FLEXWEAR	15:03
D 60	2	9000	6.43	5.71	5.83	6.02	5.71	5.30	4.78	3.88	2.33	40.0	45.0	29+960	1	4	FLEXWEAR	15:04
D 60	3	9000	6.46	5.75	5.86	6.01	5.75	5.30	4.77	3.88	2.33	40.0	45.0	29+960	1	4	FLEXWEAR	15:04
D 60	4	9000	6.43	5.71	5.83	6.02	5.71	5.26	4.78	3.88	2.33	40.0	45.0	29+960	1	4	FLEXWEAR	15:04
D 80	2	9000	6.84	6.05	6.08	6.34	6.08	5.56	5.03	4.08	2.46	40.0	46.0	29+980	1	4	FLEXWEAR	15:06
D 80	3	9000	6.89	6.10	6.10	6.39	6.06	5.61	5.04	4.12	2.50	40.0	46.0	29+980	1	4	FLEXWEAR	15:06
D 80	4	9000	6.89	6.06	6.10	6.40	6.06	5.58	5.05	4.10	2.49	40.0	46.0	29+980	1	4	FLEXWEAR	15:06
D 100	2	9000	6.63	5.99	5.99	6.18	5.91	5.50	4.93	4.03	2.45	40.0	46.0	30+000	1	4	FLEXWEAR	15:08
D 100	3	9000	6.61	5.97	5.97	6.16	5.90	5.49	4.96	4.05	2.48	40.0	46.0	30+000	1	4	FLEXWEAR	15:08
D 100	4	9000	6.62	5.94	5.94	6.17	5.86	5.45	4.97	4.06	2.52	40.0	46.0	30+000	1	4	FLEXWEAR	15:08
D 120	2	9000	6.26	5.61	5.65	5.83	5.58	5.16	4.63	3.81	2.33	41.0	50.0	30+020	1	4	FLEXWEAR	15:10
D 120	3	9000	6.25	5.58	5.61	5.83	5.54	5.15	4.63	3.84	2.37	41.0	50.0	30+020	1	4	FLEXWEAR	15:10
D 120	4	9000	6.18	5.54	5.62	5.80	5.50	5.08	4.63	3.81	2.34	41.0	50.0	30+020	1	4	FLEXWEAR	15:10
D 140	2	9000	6.83	6.04	6.12	6.30	6.04	5.51	5.02	4.07	2.45	40.0	46.0	30+040	1	4	FLEXWEAR	15:11
D 140	3	9000	6.76	6.04	6.08	6.27	5.96	5.51	4.99	4.07	2.45	40.0	46.0	30+040	1	4	FLEXWEAR	15:11
D 140	4	9000	6.77	5.98	6.09	6.28	5.94	5.52	5.00	4.08	2.46	40.0	46.0	30+040	1	4	FLEXWEAR	15:12

IKUAB FWD FILE : 112702.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Site 1 & 2
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: :
H : Site 1 Lane 1 & 2 4E10 wearing
H : Site 2 Lane 1 & 2 4E10 wearing

H :

IDate Created : 27-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

JDistance J m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D 0	2	9000	7.10	5.75	5.86	6.24	5.75	5.22	4.58	3.61	2.07	35.0	60.0	29+900	2	1	FLEXWEAR	18:08
D 0	3	9000	7.06	5.74	5.85	6.16	5.70	5.17	4.57	3.59	2.08	35.0	60.0	29+900	2	1	FLEXWEAR	18:08
D 0	4	9000	7.05	5.72	5.84	6.18	5.69	5.15	4.55	3.56	2.05	35.0	60.0	29+900	2	1	FLEXWEAR	18:08
D 20	2	9000	7.73	6.37	6.37	6.83	6.29	5.66	4.94	3.81	2.11	35.0	64.0	29+920	2	1	FLEXWEAR	18:09
D 20	3	9000	7.65	6.33	6.37	6.79	6.23	5.66	4.94	3.81	2.11	35.0	64.0	29+920	2	1	FLEXWEAR	18:10
D 20	4	9000	7.57	6.29	6.29	6.75	6.18	5.58	4.94	3.77	2.11	35.0	64.0	29+920	2	1	FLEXWEAR	18:10
D 40	2	9000	8.52	6.82	6.92	7.46	6.82	6.09	5.22	3.93	2.11	34.0	66.0	29+940	2	1	FLEXWEAR	18:12
D 40	3	9000	8.44	6.74	6.86	7.38	6.74	5.98	5.22	3.90	2.12	34.0	66.0	29+940	2	1	FLEXWEAR	18:12
D 40	4	9000	8.35	6.73	6.81	7.37	6.66	5.98	5.19	3.88	2.14	34.0	66.0	29+940	2	1	FLEXWEAR	18:12
D 60	2	9000	7.32	5.87	5.95	6.36	5.84	5.27	4.58	3.56	2.01	35.0	66.0	29+960	2	1	FLEXWEAR	18:13
D 60	3	9000	7.29	5.85	5.93	6.30	5.81	5.25	4.60	3.51	2.00	35.0	66.0	29+960	2	1	FLEXWEAR	18:13
D 60	4	9000	7.24	5.84	5.96	6.29	5.80	5.24	4.60	3.50	2.00	35.0	66.0	29+960	2	1	FLEXWEAR	18:13
D 80	2	9000	7.23	5.91	5.99	6.36	5.87	5.27	4.63	3.58	2.00	34.0	63.0	29+980	2	1	FLEXWEAR	18:15
D 80	3	9000	7.20	5.88	5.91	6.29	5.80	5.27	4.63	3.58	2.00	34.0	63.0	29+980	2	1	FLEXWEAR	18:15
D 80	4	9000	7.18	5.89	5.97	6.30	5.81	5.25	4.60	3.59	1.97	34.0	63.0	29+980	2	1	FLEXWEAR	18:15
D 100	2	9000	7.24	5.77	5.84	6.29	5.77	5.16	4.49	3.35	1.81	35.0	65.0	30+000	2	1	FLEXWEAR	18:17
D 100	3	9000	7.23	5.75	5.82	6.25	5.75	5.14	4.43	3.32	1.82	35.0	65.0	30+000	2	1	FLEXWEAR	18:17
D 100	4	9000	7.23	5.75	5.83	6.29	5.71	5.11	4.47	3.37	1.86	35.0	65.0	30+000	2	1	FLEXWEAR	18:17
D 120	2	9000	8.25	6.56	6.71	7.24	6.56	5.76	4.90	3.58	1.81	34.0	66.0	30+020	2	1	FLEXWEAR	18:18
D 120	3	9000	8.23	6.49	6.64	7.17	6.49	5.73	4.91	3.59	1.85	34.0	66.0	30+020	2	1	FLEXWEAR	18:18
D 120	4	9000	8.18	6.48	6.60	7.16	6.48	5.69	4.90	3.58	1.85	34.0	66.0	30+020	2	1	FLEXWEAR	18:18
D 140	2	9000	7.89	6.20	6.30	6.80	6.23	5.51	4.72	3.43	1.74	34.0	66.0	30+040	2	1	FLEXWEAR	18:20
D 140	3	9000	7.77	6.18	6.26	6.75	6.14	5.50	4.70	3.45	1.74	34.0	66.0	30+040	2	1	FLEXWEAR	18:20
D 140	4	9000	7.72	6.14	6.17	6.74	6.14	5.45	4.65	3.44	1.74	34.0	66.0	30+040	2	1	FLEXWEAR	18:20

IKUAB FWD FILE : 112702.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Site 2
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: :
H :
H : Site 2 Lane 2 4E10 wearing

H :

IDate Created : 27-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

J	Distance m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D	0	2	9000	7.99	6.33	6.33	6.85	6.29	5.63	4.84	3.64	2.03	37.0	69.0	30+960	2	2	FLEXWEAR	17:47
D	0	3	9000	7.95	6.32	6.32	6.86	6.25	5.57	4.86	3.65	2.00	37.0	69.0	30+960	2	2	FLEXWEAR	17:47
D	0	4	9000	7.89	6.24	6.27	6.80	6.24	5.56	4.85	3.64	2.03	37.0	69.0	30+960	2	2	FLEXWEAR	17:47
D	20	2	9000	6.42	5.29	5.37	5.67	5.33	4.88	4.36	3.45	2.07	37.0	70.0	30+980	2	2	FLEXWEAR	17:49
D	20	3	9000	6.39	5.27	5.30	5.65	5.27	4.82	4.33	3.46	2.07	37.0	70.0	30+980	2	2	FLEXWEAR	17:49
D	20	4	9000	6.31	5.27	5.31	5.61	5.23	4.82	4.34	3.44	2.06	37.0	70.0	30+980	2	2	FLEXWEAR	17:49
D	40	2	9000	6.81	5.60	5.64	5.98	5.60	5.18	4.66	3.72	2.18	37.0	70.0	31+000	2	2	FLEXWEAR	17:51
D	40	3	9000	6.74	5.54	5.58	5.95	5.50	5.16	4.63	3.69	2.14	37.0	70.0	31+000	2	2	FLEXWEAR	17:51
D	40	4	9000	6.74	5.53	5.57	5.94	5.49	5.11	4.66	3.73	2.14	37.0	70.0	31+000	2	2	FLEXWEAR	17:51
D	60	2	9000	7.20	5.80	5.91	6.29	5.76	5.20	4.55	3.54	2.00	37.0	70.0	31+020	2	2	FLEXWEAR	17:53
D	60	3	9000	7.23	5.78	5.90	6.31	5.78	5.22	4.61	3.56	2.01	37.0	70.0	31+020	2	2	FLEXWEAR	17:53
D	60	4	9000	7.17	5.73	5.84	6.23	5.73	5.16	4.56	3.51	1.96	37.0	70.0	31+020	2	2	FLEXWEAR	17:53
D	80	2	9000	7.16	5.92	5.99	6.41	5.92	5.39	4.75	3.66	2.08	37.0	69.0	31+040	2	2	FLEXWEAR	17:55
D	80	3	9000	7.12	5.87	5.95	6.36	5.87	5.35	4.71	3.69	2.08	37.0	69.0	31+040	2	2	FLEXWEAR	17:55
D	80	4	9000	7.14	5.89	5.93	6.34	5.85	5.33	4.68	3.67	2.08	37.0	69.0	31+040	2	2	FLEXWEAR	17:55
D	100	2	9000	6.11	5.02	5.06	5.35	4.94	4.49	3.96	3.09	1.77	37.0	69.0	31+060	2	2	FLEXWEAR	17:57
D	100	3	9000	6.06	4.97	4.97	5.30	4.85	4.40	3.91	3.05	1.77	37.0	69.0	31+060	2	2	FLEXWEAR	17:57
D	100	4	9000	6.05	4.97	4.97	5.26	4.85	4.40	3.91	3.05	1.77	37.0	69.0	31+060	2	2	FLEXWEAR	17:57
D	120	2	9000	9.16	7.00	7.04	7.76	7.00	6.06	5.10	3.63	1.74	36.0	73.0	31+080	2	2	FLEXWEAR	17:58
D	120	3	9000	9.06	6.90	6.90	7.66	6.90	6.00	5.09	3.62	1.77	36.0	73.0	31+080	2	2	FLEXWEAR	17:58
D	120	4	9000	8.97	6.89	6.89	7.64	6.89	6.02	5.08	3.60	1.78	36.0	73.0	31+080	2	2	FLEXWEAR	17:59
D	140	2	9000	7.44	5.85	5.96	6.37	5.81	5.17	4.50	3.35	1.85	36.0	69.0	31+100	2	2	FLEXWEAR	18:02
D	140	3	9000	7.40	5.84	5.92	6.33	5.77	5.16	4.49	3.35	1.81	36.0	69.0	31+100	2	2	FLEXWEAR	18:02
D	140	4	9000	7.36	5.85	5.92	6.30	5.77	5.13	4.50	3.35	1.81	36.0	69.0	31+100	2	2	FLEXWEAR	18:02

IKUAB FWD FILE : 112602.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Sites 2
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing 4E10
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: :
H : Site 2 Lane 3 4E10 wearing
H :

H :

IDate Created : 26-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36.00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

J	Distance m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D	0	2	9000	7.11	6.17	6.13	6.50	6.13	5.61	5.04	3.98	2.37	38.0	60.0	30+960	2	3	FLEXWEAR	14:36
D	0	3	9000	7.05	6.11	6.07	6.45	6.07	5.59	5.03	3.97	2.40	38.0	60.0	30+960	2	3	FLEXWEAR	14:36
D	0	4	9000	7.08	6.18	6.10	6.51	6.10	5.61	5.05	4.03	2.41	38.0	60.0	30+960	2	3	FLEXWEAR	14:37
D	20	2	9000	7.47	6.37	6.33	6.75	6.33	5.73	5.06	3.96	2.30	40.0	62.0	30+980	2	3	FLEXWEAR	14:39
D	20	3	9000	7.41	6.31	6.27	6.69	6.27	5.67	5.04	3.98	2.29	40.0	62.0	30+980	2	3	FLEXWEAR	14:39
D	20	4	9000	7.41	6.28	6.28	6.66	6.24	5.64	5.04	3.92	2.24	40.0	62.0	30+980	2	3	FLEXWEAR	14:39
D	40	2	9000	7.93	6.65	6.61	7.10	6.69	6.01	5.33	4.13	2.33	40.0	65.0	31+000	2	3	FLEXWEAR	14:41
D	40	3	9000	7.86	6.66	6.58	7.07	6.62	5.98	5.34	4.10	2.33	40.0	65.0	31+000	2	3	FLEXWEAR	14:41
D	40	4	9000	7.90	6.65	6.62	7.07	6.65	6.02	5.38	4.17	2.41	40.0	65.0	31+000	2	3	FLEXWEAR	14:41
D	60	2	9000	8.03	6.64	6.60	7.09	6.67	5.96	5.24	4.11	2.34	39.0	67.0	31+020	2	3	FLEXWEAR	14:43
D	60	3	9000	7.93	6.54	6.54	6.98	6.54	5.90	5.22	4.05	2.29	39.0	67.0	31+020	2	3	FLEXWEAR	14:43
D	60	4	9000	7.91	6.55	6.51	7.00	6.51	5.91	5.23	4.06	2.29	39.0	67.0	31+020	2	3	FLEXWEAR	14:43
D	80	2	9000	7.49	6.35	6.35	6.77	6.43	5.86	5.18	4.12	2.38	40.0	63.0	31+040	2	3	FLEXWEAR	14:45
D	80	3	9000	7.42	6.32	6.32	6.74	6.32	5.80	5.16	4.10	2.37	40.0	63.0	31+040	2	3	FLEXWEAR	14:45
D	80	4	9000	7.38	6.28	6.28	6.70	6.28	5.76	5.12	4.06	2.37	40.0	63.0	31+040	2	3	FLEXWEAR	14:45
D	100	2	9000	7.00	5.80	5.83	6.26	5.87	5.35	4.71	3.69	2.08	40.0	65.0	31+060	2	3	FLEXWEAR	14:46
D	100	3	9000	6.95	5.79	5.79	6.25	5.86	5.30	4.70	3.69	2.10	40.0	65.0	31+060	2	3	FLEXWEAR	14:46
D	100	4	9000	6.74	5.65	5.57	6.02	5.65	5.07	4.44	3.38	1.77	40.0	65.0	31+060	2	3	FLEXWEAR	14:47
D	120	2	9000	7.90	6.43	6.43	6.92	6.47	5.79	5.07	3.91	2.22	40.0	68.0	31+080	2	3	FLEXWEAR	14:48
D	120	3	9000	7.82	6.42	6.39	6.87	6.42	5.75	5.07	3.90	2.21	40.0	68.0	31+080	2	3	FLEXWEAR	14:48
D	120	4	9000	7.81	6.41	6.37	6.87	6.37	5.77	5.09	3.89	2.22	40.0	68.0	31+080	2	3	FLEXWEAR	14:48
D	140	2	9000	7.76	6.44	6.48	6.89	6.44	5.84	5.16	3.95	2.22	40.0	67.0	31+100	2	3	FLEXWEAR	14:50
D	140	3	9000	7.75	6.39	6.39	6.88	6.39	5.75	5.11	3.98	2.22	40.0	67.0	31+100	2	3	FLEXWEAR	14:50
D	140	4	9000	7.71	6.40	6.43	6.85	6.40	5.79	5.11	3.99	2.26	40.0	67.0	31+100	2	3	FLEXWEAR	14:50
D	0	2	9000	6.89	6.02	6.02	6.32	6.02	5.49	4.96	4.05	2.42	38.0	52.0	30+960	2	3	FLEXWEAR	15:48
D	0	3	9000	6.82	5.98	5.90	6.25	5.90	5.45	4.88	3.97	2.42	38.0	52.0	30+960	2	3	FLEXWEAR	15:48
D	0	4	9000	6.78	5.94	5.87	6.21	5.87	5.42	4.86	3.99	2.41	38.0	52.0	30+960	2	3	FLEXWEAR	15:49
D	20	2	9000	7.05	6.11	6.11	6.44	6.11	5.50	4.90	3.92	2.30	39.0	57.0	30+980	2	3	FLEXWEAR	15:50

s2l3e4.fwd

D	20	3	9000	7.00	6.06	6.06	6.39	6.02	5.49	4.92	3.90	2.31	39.0	57.0	30+980	2	3	FLEXWEAR	15:50
D	20	4	9000	7.02	6.08	6.05	6.42	6.05	5.52	4.91	3.90	2.30	39.0	57.0	30+980	2	3	FLEXWEAR	15:50
D	40	2	9000	7.51	6.36	6.32	6.79	6.36	5.80	5.11	4.09	2.43	39.0	60.0	31+000	2	3	FLEXWEAR	15:52
D	40	3	9000	7.44	6.30	6.27	6.72	6.27	5.73	5.09	4.07	2.38	39.0	60.0	31+000	2	3	FLEXWEAR	15:52
D	40	4	9000	7.39	6.29	6.25	6.67	6.29	5.71	5.08	4.09	2.39	39.0	60.0	31+000	2	3	FLEXWEAR	15:52
D	60	2	9000	7.46	6.28	6.25	6.70	6.28	5.68	5.03	3.97	2.27	38.0	61.0	31+020	2	3	FLEXWEAR	15:54
D	60	3	9000	7.43	6.22	6.19	6.64	6.15	5.62	4.98	3.96	2.30	38.0	61.0	31+020	2	3	FLEXWEAR	15:54
D	60	4	9000	7.42	6.24	6.17	6.62	6.17	5.64	5.03	3.97	2.31	38.0	61.0	31+020	2	3	FLEXWEAR	15:54
D	80	2	9000	7.17	6.15	6.08	6.53	6.15	5.67	5.02	4.04	2.38	39.0	58.0	31+040	2	3	FLEXWEAR	15:55
D	80	3	9000	7.11	6.13	6.09	6.51	6.13	5.64	5.00	4.05	2.38	39.0	58.0	31+040	2	3	FLEXWEAR	15:55
D	80	4	9000	7.12	6.10	6.06	6.44	6.06	5.58	5.01	4.03	2.37	39.0	58.0	31+040	2	3	FLEXWEAR	15:55
D	100	2	9000	6.72	5.67	5.59	6.04	5.70	5.17	4.57	3.63	2.08	39.0	61.0	31+060	2	3	FLEXWEAR	15:57
D	100	3	9000	6.68	5.62	5.59	6.00	5.59	5.13	4.56	3.62	2.08	39.0	61.0	31+060	2	3	FLEXWEAR	15:57
D	100	4	9000	6.64	5.63	5.51	5.96	5.59	5.09	4.53	3.59	2.08	39.0	61.0	31+060	2	3	FLEXWEAR	15:57
D	120	2	9000	7.21	6.07	6.03	6.48	6.07	5.46	4.86	3.83	2.20	38.0	62.0	31+080	2	3	FLEXWEAR	15:59
D	120	3	9000	7.18	6.08	6.04	6.42	5.97	5.48	4.84	3.82	2.23	38.0	62.0	31+080	2	3	FLEXWEAR	15:59
D	120	4	9000	7.15	6.06	6.02	6.39	5.98	5.45	4.81	3.79	2.19	38.0	62.0	31+080	2	3	FLEXWEAR	15:59
D	140	2	9000	7.20	6.10	6.14	6.48	6.10	5.57	4.89	3.87	2.23	39.0	61.0	31+100	2	3	FLEXWEAR	16:00
D	140	3	9000	7.19	6.06	6.09	6.47	6.02	5.53	4.92	3.86	2.23	39.0	61.0	31+100	2	3	FLEXWEAR	16:00
D	140	4	9000	7.11	6.01	6.05	6.46	5.97	5.48	4.88	3.86	2.23	39.0	61.0	31+100	2	3	FLEXWEAR	16:00

IKUAB FWD FILE : 112602.nor
HProject: : US-24 Research Project
HProject Number: : CS 83053 JN 57994
HRoute: : US-24
HDirection: : NB
HLocation: : Sites 2
H :
HRegion: : Metro
HCustomer/Client: : MDOT
HRoadway Type: : top wearing 4E10
HEnvironment: : cloudy,cold
HOperator: : Kurt S. Bancroft
HComments: : S
H : Site 2 Lane 4 4E10 wearing
H :

H :

IDate Created : 26-11-2002
ILoad Mode : 2 (3+3 buffers, 7 plates)
IPlate Radius : 5.91 (in)
IExtra Field Set : US24
IDrop Sequence : 22
INo of drops : 13
IRecord Drop? : NY
IDrop Height : 1 2 3 4
IImpact Load : 5000 9000 15500 20500 lbf
ISensor Number : 0 1 2 3 4 5 6 7 8
ISensor Distance : 0.00 12.00 12.00 8.00 12.00 18.00 24.00 36:00 60.00 (in)
ISensor Position : CENTER FRONT RIGHT BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND

IReference Offset : 0 m
ITestpoint spacing: 20 m

J	Distance m	Imp Num	Load lbf	D0 mils	D1 mils	D2 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Air øF	Pave øF	Station	Test Site	Test Lane	Rdwy. Mtrl	Test Time
D	0	2	9000	6.20	5.50	5.61	5.83	5.58	5.12	4.68	3.90	2.49	40.0	50.0	30+960	2	4	FLEXWEAR	13:07
D	0	3	9000	6.16	5.49	5.53	5.75	5.53	5.12	4.64	3.89	2.53	40.0	50.0	30+960	2	4	FLEXWEAR	13:08
D	0	4	9000	6.11	5.44	5.48	5.73	5.48	5.03	4.58	3.84	2.48	40.0	50.0	30+960	2	4	FLEXWEAR	13:08
D	20	2	9000	6.05	5.42	5.46	5.68	5.42	5.01	4.56	3.83	2.41	41.0	51.0	30+980	2	4	FLEXWEAR	13:09
D	20	3	9000	6.06	5.35	5.43	5.65	5.39	4.98	4.57	3.79	2.42	41.0	51.0	30+980	2	4	FLEXWEAR	13:09
D	20	4	9000	6.06	5.35	5.39	5.64	5.35	5.01	4.53	3.79	2.41	41.0	51.0	30+980	2	4	FLEXWEAR	13:10
D	40	2	9000	6.35	5.64	5.68	5.87	5.64	5.20	4.72	3.90	2.41	40.0	50.0	31+000	2	4	FLEXWEAR	13:11
D	40	3	9000	6.25	5.62	5.62	5.85	5.55	5.17	4.69	3.87	2.38	40.0	50.0	31+000	2	4	FLEXWEAR	13:11
D	40	4	9000	6.40	5.69	5.73	5.96	5.65	5.29	4.80	3.98	2.50	40.0	50.0	31+000	2	4	FLEXWEAR	13:11
D	60	2	9000	6.07	5.40	5.48	5.62	5.40	4.96	4.54	3.80	2.46	40.0	49.0	31+020	2	4	FLEXWEAR	13:13
D	60	3	9000	5.98	5.35	5.42	5.57	5.35	4.94	4.52	3.75	2.41	40.0	49.0	31+020	2	4	FLEXWEAR	13:13
D	60	4	9000	6.06	5.38	5.42	5.61	5.35	4.98	4.52	3.78	2.43	40.0	49.0	31+020	2	4	FLEXWEAR	13:13
D	80	2	9000	5.84	5.20	5.32	5.43	5.24	4.80	4.39	3.61	2.27	40.0	50.0	31+040	2	4	FLEXWEAR	13:15
D	80	3	9000	5.79	5.20	5.24	5.42	5.16	4.79	4.31	3.57	2.26	40.0	50.0	31+040	2	4	FLEXWEAR	13:15
D	80	4	9000	5.82	5.19	5.26	5.41	5.15	4.82	4.33	3.58	2.24	40.0	50.0	31+040	2	4	FLEXWEAR	13:15
D	100	2	9000	6.22	5.55	5.59	5.85	5.62	5.17	4.69	3.91	2.46	40.0	50.0	31+060	2	4	FLEXWEAR	13:17
D	100	3	9000	6.21	5.55	5.65	5.88	5.59	5.21	4.73	3.94	2.50	40.0	50.0	31+060	2	4	FLEXWEAR	13:17
D	100	4	9000	6.20	5.58	5.65	5.87	5.58	5.20	4.76	3.94	2.49	40.0	50.0	31+060	2	4	FLEXWEAR	13:17
D	120	2	9000	5.62	4.99	5.06	5.25	5.02	4.69	4.25	3.54	2.27	40.0	50.0	31+080	2	4	FLEXWEAR	13:18
D	120	3	9000	5.58	4.95	5.02	5.24	5.02	4.65	4.24	3.53	2.30	40.0	50.0	31+080	2	4	FLEXWEAR	13:19
D	120	4	9000	5.59	4.95	5.02	5.21	5.02	4.65	4.24	3.53	2.27	40.0	50.0	31+080	2	4	FLEXWEAR	13:19
D	140	2	9000	5.80	5.20	5.20	5.43	5.24	4.83	4.35	3.67	2.32	41.0	50.0	31+100	2	4	FLEXWEAR	13:20
D	140	3	9000	5.79	5.23	5.23	5.42	5.19	4.82	4.41	3.66	2.31	41.0	50.0	31+100	2	4	FLEXWEAR	13:20
D	140	4	9000	5.84	5.21	5.24	5.40	5.13	4.83	4.39	3.64	2.32	41.0	50.0	31+100	2	4	FLEXWEAR	13:21

Backcalculation Results

2002 US-24 Perpetual Pavement Demo Project
Control Section 83053 Job Number 57994

Site	Lane	Average Michback Analysis Results					
		Surface Temp.	Bit. Layer	Base/ Subbase Layer	Subgrade Layer	AASHTO Corrected Mr	RMS(%)
		F	ksi	ksi	ksi	psi	
1	1	57	1647	14.6	16.5	5445	0.74
1	2	61	1022	12.1	17.8	5879	0.57
1	3	61	1196	6.6	19.1	6318	0.63
1	4	64	972	10.0	14.2	4694	0.43
2	1	65	1016	15.0	21.0	6934	0.82
2	2	70	1171	16.5	20.8	6870	1.05
2	3	62	1170	11.7	17.7	5854	0.64
2	4	50	2558	8.1	20.0	6606	0.56

2002 US-24 Perpetual Pavement Demo Project
Control Section 83053 Job Number 57994

Site	Lane	Average TTI Modulus5.1 Analysis Results						
		Surface Temp.	Bit. Layer	Aggregate Base Layer	Sand Subbase Layer	Subgrade Layer	AASHTO Corrected Mr	Absolute ERR/Sens
		F	ksi	ksi	ksi	ksi	psi	
1	1	57	1541	22.6	22.2	13.6	4500	0.53
1	2	61	976	16.7	21.4	12.3	4051	0.4
1	3	61	1119	12.6	17.6	10.3	3395	0.61
1	4	64	911	14.6	23.8	9.4	3098	0.36
2	1	65	888	27.4	38.2	10.7	3531	0.41
2	2	70	912	49.9	32.3	11.6	3832	0.49
2	3	59	1386	27.5	14.5	11.9	3935	0.39
2	4	50	2104	37.5	29.9	11.7	3857	0.44

Site 1

Michback	Filename:	LayerModulus														
Control	Section:	83053														
Job	Number:	57994														
Route:	US-24															
Lane:	NB	4E10	Wearing													
Region:	Metro															
Trial	Number:	1		10" Bit.(4E10,3E10,2E10), 12" Base Aggregate, 14 " Sand Subbase												
Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			Base/		AASHTO	Depth		
									Temp.	Bit.	Subbase	Subgrade	Corrected	Stiff		Converge
Sta./Mp	Load	D0	D3	D4	D5	D6	D7	D8	Pvmt	Modulus	Modulus	Modulus	Mr	Layer	RMS(%)	y/n
s1l1	Wearing															
29900	9000	7.13	6.50	6.06	5.51	4.89	3.88	2.25	56	1429105	14288	15801	5214	363	0.5319	Y
29920	9000	6.03	5.51	5.18	4.81	4.33	3.54	2.14	59	2050148	14301	16972	5601	363	0.7742	Y
29940	9000	6.39	5.71	5.36	4.95	4.45	3.60	2.16	60	1682289	18896	15821	5221	363	1.0265	Y
29960	9000	6.47	5.91	5.53	5.08	4.55	3.64	2.17	56	1716407	14768	16493	5443	363	0.4481	Y
29980	9000	6.13	5.56	5.21	4.80	4.32	3.53	2.15	54	1816099	19690	15764	5202	363	0.8344	Y
30000	9000	8.00	7.36	6.87	6.27	5.55	4.28	2.40	54	1328790	7464	17365	5730	363	0.5874	Y
30020	9000	6.44	5.81	5.48	5.03	4.49	3.63	2.16	59	1726989	15559	16242	5360	363	0.9338	Y
30040	9000	7.08	6.39	5.94	5.40	4.81	3.79	2.13	60	1426792	11879	17552	5792	363	0.8108	Y
									57	**1647077**	**14606**	**16501**	**5445**	**363**	**0.74**	
										239288	**3851**	**721**	**238**	**0**	**0**	
										15%	**26%**	**4%**	**4%**	**0%**	**27%**	
s1l2	Wearing															
29900	9000	8.50	7.58	6.90	6.12	5.26	3.91	2.10	60	809588	14073	17416	5747	403	0.8807	Y
29920	9000	8.69	7.81	7.16	6.31	5.48	4.08	2.17	61	872308	12055	17163	5664	403	0.466	Y
29940	9000	8.73	7.77	7.10	6.26	5.37	3.94	2.06	62	807007	12628	17915	5912	403	0.4902	Y
29960	9000	7.67	6.88	6.37	5.72	5.00	3.80	2.05	61	1126758	11841	18812	6208	403	0.4399	Y
29980	9000	6.95	6.21	5.73	5.20	4.59	3.58	1.99	61	1319444	14017	18857	6223	403	0.7931	Y
30000	9000	8.01	7.26	6.74	6.14	5.39	4.18	2.30	59	1234883	9279	17347	5725	403	0.6026	Y
30020	9000	8.08	7.27	6.72	6.00	5.27	3.99	2.15	60	1057707	11265	17941	5921	403	0.4398	Y
30040	9000	8.52	7.65	7.02	6.28	5.45	4.11	2.21	62	944512	11698	17065	5631	403	0.429	Y
									61	**1021526**	**12107**	**17815**	**5879**	**403**	**0.57**	
										194860	**1546**	**704**	**232**	**0**	**0**	
										19%	**13%**	**4%**	**4%**	**0%**	**31%**	
s1l3	Wearing															
29900	9000	8.71	7.92	7.35	6.56	5.71	4.32	2.38	58	993459	9590	17546	5790	543	0.7428	Y
29920	9000	7.88	7.26	6.81	6.17	5.48	4.28	2.42	59	1376300	7742	18672	6162	543	0.5409	Y
29940	9000	8.47	7.80	7.30	6.63	5.86	4.54	2.54	62	1268320	6361	18764	6192	543	0.4677	Y
29960	9000	9.01	8.39	7.85	7.06	6.16	4.67	2.49	63	1134628	4921	21721	7168	543	0.9169	Y
29980	9000	8.02	7.41	6.98	6.40	5.70	4.48	2.55	62	1502801	5114	20966	6919	543	0.3198	Y
30000	9000	8.64	7.89	7.40	6.74	5.92	4.59	2.58	63	1209378	6956	18138	5986	543	0.8307	Y
30020	9000	8.82	8.11	7.55	6.85	6.01	4.62	2.50	64	1178879	5649	19885	6562	543	0.719	Y
30040	9000	10.09	9.21	8.55	7.67	6.69	5.02	2.66	59	904321	6184	17467	5764	543	0.5071	Y
									61	**1196011**	**6565**	**19145**	**6318**	**543**	**0.63**	
										193540	**1536**	**1570**	**518**	**0**	**0.20**	
										16%	**23%**	**8%**	**8%**	**0%**	**32%**	
s1l4	Wearing															
29900	9000	8.43	7.62	7.08	6.38	5.62	4.33	2.37	60	1129964	9455	15767	5203	337	0.5896	Y
29920	9000	9.25	8.32	7.68	6.87	6.04	4.60	2.52	63	907447	11951	13687	4517	337	0.3662	Y
29940	9000	9.10	8.25	7.65	6.90	6.04	4.58	2.50	64	997275	9573	14618	4824	337	0.441	Y
29960	9000	8.72	7.91	7.38	6.63	5.81	4.45	2.46	62	1043832	10437	14729	4861	337	0.2927	Y
29980	9000	9.91	8.91	8.23	7.39	6.45	4.92	2.63	64	875485	9024	13956	4605	337	0.4091	Y
30000	9000	9.72	8.75	8.15	7.32	6.44	4.93	2.70	64	938844	9113	13564	4476	337	0.1881	Y
30020	9000	9.24	8.20	7.61	6.85	6.02	4.61	2.55	66	923934	12205	13528	4464	337	0.4721	Y
30040	9000	9.78	8.84	8.19	7.40	6.48	4.95	2.66	67	956305	8186	13936	4599	337	0.6545	Y
									64	**971636**	**9993**	**14223**	**4694**	**337**	**0.43**	
										82712	**1433**	**770**	**254**	**0**	**0.15**	
										9%	**14%**	**5%**	**5%**	**0%**	**35%**	

Michback	Filename:															
Control	Section:	83053														
Job	Number:	57994														
Route:		US-24	NB													
Lane:			3E10	Leveling												
Region:		Metro														
Trial	Number:	1		7.5" Bit.(3E10), 12" Base Aggregate, 14 " Sand Subbase												
Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			Base/		AASHTO	Depth		
									Temp.	Bit.	Subbase	Subgrade	Corrected	Stiff		Converge
Sta./Mp	Load	D0	D3	D4	D5	D6	D7	D8	Pvmt	Modulus	Modulus	Modulus	Mr	Layer	RMS(%)	y/n
s1l3	Leveling															
29900	9000	12.81	11.03	9.71	8.05	6.54	4.34	2.16	66	600272	15313	15466	5104	475	0.4469	Y
29920	9000	11.48	10.09	9.01	7.72	6.46	4.51	2.29	66	860337	15407	15060	4970	475	0.4758	Y
29940	9000	11.88	10.55	9.44	8.04	6.71	4.65	2.31	67	873143	12940	15023	4958	475	0.4246	Y
29960	9000	12.57	11.03	9.78	8.25	6.77	4.58	2.25	66	712832	13611	15108	4986	475	0.5445	Y
29980	9000	12.19	10.70	9.54	8.07	6.71	4.62	2.32	68	772955	14270	14770	4874	475	0.3429	Y
30000	9000	12.71	11.15	9.97	8.47	7.05	4.85	2.39	67	785364	12456	14419	4758	475	0.3157	Y
30020	9000	12.13	10.67	9.52	8.04	6.68	4.56	2.23	68	800789	12957	15434	5093	475	0.3089	Y
30040	9000	12.76	11.02	9.73	8.10	6.62	4.38	2.11	67	647590	13748	15908	5250	475	0.4551	Y
									67	**756660**	**13838**	**15149**	**4999**	**475**	**0.41**	
										96827	**1094**	**457**	**151**	**0**	**0.08**	
										13%	**8%**	**3%**	**3%**	**0%**	**20%**	

s1l4	Leveling															
29900	9000	17.19	13.94	11.78	9.34	7.41	4.70	2.20	79	318492	13931	13415	4427	347	0.6702	Y
29920	9000	18.39	15.35	13.26	10.67	8.53	5.33	2.46	80	351538	11175	12145	4008	347	0.4919	Y
29940	9000	17.26	14.78	12.94	10.64	8.57	5.43	2.36	76	465698	9471	12925	4265	347	0.6863	Y
29960	9000	16.18	13.85	12.21	10.11	8.18	5.30	2.34	76	517763	9875	13313	4393	347	0.2705	Y
29980	9000	16.81	14.53	12.78	10.58	8.63	5.67	2.61	73	492014	10199	11924	3935	347	0.3604	Y
30000	9000	18.77	15.93	13.93	11.48	9.23	5.87	2.58	77	413077	8976	11873	3918	347	0.3364	Y
30020	9000	17.46	14.77	12.92	10.67	8.69	5.67	2.56	77	455261	10127	12019	3966	347	0.5914	Y
30040	9000	17.86	14.96	12.96	10.58	8.52	5.47	2.60	77	373747	12075	11557	3814	347	0.5861	Y
									77	423449	10729	12396	4091	347	0.50	
										70870	1617	714	235	0	0.16	
										17%	15%	6%	6%	0%	32%	
Michback	Filename:															
Control	Section:	83053														
Job	Number:	57994														
Route:		US-24	NB													
Lane:			2E10	Base												
Region:		Metro														
Trial	Number:	1		4.5" Bit.(2E10), 12" Base Aggregate, 14 " Sand Subbase												
Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			Base/		AASHTO	Depth		
									Temp.	Bit.	Subbase	Subgrade	Corrected	Stiff		Converge
Sta./Mp	Load	D0	D3	D4	D5	D6	D7	D8	Pvmt	Modulus	Modulus	Modulus	Mr	Layer	RMS(%)	y/n
s1l1	Base															
29900	9000	34.72	22.84	16.24	10.27	7.19	4.26	2.30	119	105946	13828	11825	3902	271	2.5043	Y
29920	9000	30.83	21.37	15.30	9.51	6.37	3.55	1.88	120	150044	13546	14223	4694	271	3.0491	Y
29940	9000	32.09	21.68	15.76	9.73	6.59	3.57	1.88	125	140669	13102	14068	4642	271	2.7634	Y
29960	9000	27.39	18.38	13.51	9.18	6.78	4.19	2.05	125	176310	17082	12636	4170	271	1.3515	Y
29980	9000	29.60	21.15	16.17	10.92	8.02	4.73	2.27	124	225957	13511	11304	3730	271	1.0662	Y
30000	9000	39.10	27.92	20.94	13.97	9.96	5.42	2.36	125	198883	8911	10310	3402	271	2.1205	Y
30020	9000	27.69	19.65	15.14	10.59	7.71	4.38	1.89	124	324406	12590	12959	4276	271	2.9531	Y
30040	9000	28.69	19.88	14.81	9.87	6.99	3.84	1.77	120	235346	13148	14110	4656	271	1.5184	Y
									123	194695	13215	12679	4184	271	2.17	
										68242	2219	1448	478	0	0.77	
										35%	17%	11%	11%	0%	36%	
s1l2	Base															
29900	9000	28.42	18.55	12.27	7.74	5.57	3.65	2.14	123	93899	19284	14726	4860	351	4.4475	Y
29920	9000	29.26	20.00	14.11	8.81	6.34	3.68	2.07	123	143160	15452	14548	4801	351	2.8695	Y
29940	9000	32.39	21.65	14.87	9.04	6.35	3.81	2.01	125	108087	14349	14498	4784	351	2.229	Y
29960	9000	33.14	23.52	17.65	11.95	8.76	5.12	2.34	122	207994	11460	11558	3814	351	3.025	Y
29980	9000	32.20	23.51	17.67	11.75	8.24	4.52	2.02	121	249468	10318	13263	4377	351	1.9643	Y
30000	9000	40.96	31.22	24.72	17.74	13.07	4.95	2.83	122	269184	6453	10323	3407	351	9.3842	Y
30020	9000	42.40	30.93	23.20	15.57	11.05	5.84	2.41	121	233278	7067	10767	3553	351	3.2085	Y
30040	9000	34.46	24.42	18.02	11.79	8.43	4.78	2.08	119	227265	10102	12795	4222	351	3.4302	Y
									122	191542	11811	12810	4227	351	3.82	
										67095	4343	1760	581	0	2.37	
										35%	37%	14%	14%	0%	62%	
s1l3	Base															
29900	9000	34.56	23.06	15.88	9.66	6.70	4.07	2.33	104	99244	13486	14247	4702	528	2.8076	Y
29920	9000	38.99	24.37	17.72	11.68	8.31	4.85	2.61	119	107919	11876	12128	4002	528	1.7299	Y
29940	9000	33.24	22.44	15.76	10.21	7.33	4.44	2.41	114	127437	13611	13357	4408	528	1.1065	Y
29960	9000	35.10	24.42	17.59	11.05	7.72	4.35	2.33	105	147680	11347	13610	4491	528	1.1733	Y
29980	9000	47.17	30.73	21.13	13.15	9.13	5.08	2.46	122	96771	8757	12107	3995	528	2.5543	Y
30000	9000	48.47	31.01	20.53	13.21	9.83	5.86	2.69	124	83345	9386	10868	3586	528	5.1431	Y
30020	9000	37.05	24.34	16.62	10.52	7.64	4.66	2.52	122	95074	12904	12739	4204	528	1.5426	Y
30040	9000	37.62	25.71	18.98	12.41	8.81	5.08	2.65	106	147760	10739	11822	3901	528	0.9074	Y
									116	113154	11513	12610	4161	528	2.12	
										24780	1817	1095	361	0	1.40	
										22%	16%	9%	9%	0%	66%	
s1l4	Base															
29900	9000	19.66	16.18	13.59	10.39	7.86	4.52	2.05	67	911410	12615	13476	4447	320	0.6434	Y
29920	9000	21.45	18.05	15.34	11.84	8.99	5.29	2.42	67	879335	11269	11558	3814	320	0.4517	Y
29940	9000	19.79	16.78	14.34	11.18	8.57	5.01	2.18	67	1084823	10990	12726	4200	320	0.3572	Y
29960	9000	19.33	16.40	14.07	11.11	8.67	5.21	2.18	68	1257302	10491	12758	4210	320	0.6971	Y
29980	9000	21.13	17.95	15.33	12.07	9.39	5.62	2.44	68	1078118	10204	11457	3781	320	0.5035	Y
30000	9000	22.54	19.36	16.66	13.17	10.28	6.19	2.55	67	1134116	8498	10939	3610	320	0.6121	Y
30020	9000	20.04	17.04	14.63	11.69	9.12	5.56	2.44	68	1206616	10662	11570	3818	320	0.5918	Y
30040	9000	20.40	17.14	14.56	11.37	8.77	5.26	2.39	67	977860	12075	11643	3842	320	0.5913	Y
									67	1066198	10851	12016	3965	320	0.56	
										135236	1249	862	285	0	0.11	
										13%	12%	7%	7%	0%	20%	
								Site 2								
Michback	Filename:															
Control	Section:	83053														
Job	Number:	57994														
Route:		US-24	NB													
Lane:			4E10	Wearing												
Region:		Metro														
Trial	Number:	1		10" Bit.(4E10), 12" Base Aggregate, 14 " Sand Subbase												

Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			Base/		AASHTO	Depth		
									Temp.	Bit.	Subbase	Subgrade	Corrected	Stiff		Converge
Sta./Mp	Load	D0	D3	D4	D5	D6	D7	D8	Pvmt	Modulus	Modulus	Modulus	Mr	Layer	RMS(%)	y/n
s2l1																
30960	9000	7.07	6.19	5.71	5.18	4.57	3.59	2.07	60	1178083	18414	19215	6341	720	1.0298	Y
30980	9000	7.65	6.79	6.23	5.63	4.94	3.80	2.11	64	1111719	13065	19735	6513	720	0.7903	Y
31000	9000	8.44	7.40	6.74	6.02	5.21	3.90	2.12	66	848287	14344	19078	6296	720	0.6789	Y
31020	9000	7.28	6.32	5.82	5.25	4.59	3.52	2.00	66	1058621	17903	19895	6565	720	0.9197	Y
31040	9000	7.20	6.32	5.83	5.26	4.62	3.58	1.99	63	1173757	14657	20804	6865	720	0.9853	Y
34060	9000	7.23	6.28	5.74	5.14	4.46	3.35	1.83	65	996372	17182	22031	7270	720	0.7943	Y
31080	9000	8.22	7.19	6.51	5.73	4.90	3.58	1.84	66	826651	12477	22651	7475	720	0.6987	Y
31100	9000	7.79	6.76	6.17	5.49	4.69	3.44	1.74	66	930551	11834	24694	8149	720	0.681	Y
									65	1015505	14985	21013	6934	720	0.82	
										138256	2550	1970	650	0.00	0.14	
										14%	17%	9%	9%	0%	17%	
s2l2																
30960	9000	7.94	6.84	6.26	5.59	4.85	3.64	2.02	69	833453	18949	19168	6325	720	0.8714	Y
30980	9000	6.37	5.64	5.28	4.84	4.34	3.45	2.07	70	1525829	19052	19361	6389	720	0.995	Y
31000	9000	6.76	5.96	5.53	5.15	4.65	3.71	2.15	70	1630530	11833	20213	6670	720	1.6531	Y
31020	9000	7.20	6.28	5.76	5.19	4.57	3.54	1.99	70	1107798	17308	20146	6648	720	1.0585	Y
31040	9000	7.14	6.37	5.88	5.36	4.71	3.67	2.08	69	1279572	13714	20110	6636	720	0.778	Y
34060	9000	6.07	5.30	4.88	4.43	3.93	3.06	1.77	69	1371726	21494	22464	7413	720	1.0895	Y
31080	9000	9.06	7.69	6.93	6.03	5.09	3.62	1.76	73	666399	11984	23173	7647	720	0.9634	Y
31100	9000	7.40	6.33	5.78	5.15	4.50	3.35	1.82	69	948915	17280	21919	7233	720	0.9738	Y
									70	1170528	16452	20819	6870	720	1.05	
										340383	3558	1494	493	0.00	0.26	
										29%	22%	7%	7%	0%	25%	
s2l3																
30960	9000	6.83	6.26	5.93	5.45	4.90	4.00	2.42	52	1865491	8833	18863	6225	720	0.8092	Y
30980	9000	7.02	6.42	6.06	5.50	4.91	3.91	2.30	57	1559250	10411	19463	6423	720	0.4608	Y
31000	9000	7.45	6.73	6.31	5.75	5.09	4.08	2.40	60	1392876	11864	17731	5851	720	0.6461	Y
31020	9000	7.44	6.65	6.20	5.65	5.01	3.97	2.29	61	1325296	12276	18559	6124	720	0.7262	Y
31040	9000	7.13	6.49	6.11	5.63	5.01	4.04	2.38	58	1644925	9411	18962	6257	720	0.7115	Y
34060	9000	6.68	6.00	5.63	5.13	4.55	3.61	2.08	61	1561205	11577	21352	7046	720	0.7277	Y
31080	9000	7.18	6.43	6.01	5.46	4.84	3.81	2.21	62	1359640	12728	19261	6356	720	0.5914	Y
31100	9000	7.17	6.47	6.03	5.53	4.90	3.86	2.23	61	1451878	10770	19766	6523	720	0.598	Y
									59	1520070	10984	19245	6351	720	0.66	
										178339	1379	1052	347	0.00	0.11	
										12%	13%	5%	5%	0%	16%	
s2l4																
30960	9000	6.16	5.77	5.53	5.09	4.63	3.88	2.50	50	2432731	10189	17237	5688	720	0.9588	Y
30980	9000	6.06	5.66	5.39	5.00	4.55	3.80	2.41	51	2540787	7980	19363	6390	720	0.688	Y
31000	9000	6.33	5.89	5.61	5.22	4.74	3.92	2.43	50	2414993	5896	21749	7177	720	0.3908	Y
31020	9000	6.04	5.60	5.37	4.96	4.53	3.78	2.43	49	2451140	10982	17748	5857	720	0.4408	Y
31040	9000	5.82	5.42	5.18	4.80	4.34	3.59	2.26	50	2529708	8166	21346	7044	720	0.359	Y
34060	9000	6.21	5.87	5.60	5.19	4.73	3.93	2.48	50	2592256	5645	21055	6948	720	0.6992	Y
31080	9000	5.60	5.23	5.02	4.66	4.24	3.53	2.28	50	2776813	9124	20281	6693	720	0.3098	Y
31100	9000	5.81	5.42	5.19	4.83	4.38	3.66	2.32	50	2724164	7004	21374	7053	720	0.6674	Y
									50	2557824	8123	20019	6606	720	0.56	
										133803	1921	1734	572	0.00	0.22	
													9%			
										5%	24%	9%		0%	40%	

Michback	Filename:															
Control	Section:	83053														
Job	Number:	57994														
Route:		US-24	NB													
Lane:			3E10	Leveling												
Region:		Metro														
Trial	Number:	1		7.5" Bit.(4E10), 12" Base Aggregate, 14 " Sand Subbase												
Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			Base/		AASHTO	Depth		
									Temp.	Bit.	Subbase	Subgrade	Corrected	Stiff		Converge
Sta./Mp	Load	D0	D3	D4	D5	D6	D7	D8	Pvmt	Modulus	Modulus	Modulus	Mr	Layer	RMS(%)	y/n
s2l3																
30960	9000	7.42	6.92	6.51	5.94	5.29	4.19	2.47	60	2854480	23799	10086	3328	209	0.4849	Y
30980	9000	7.55	6.97	6.57	5.92	5.25	4.03	2.26	61	2596967	18801	11690	3858	209	0.1657	Y
31000	9000	7.86	7.28	6.83	6.16	5.43	4.22	2.38	60	2411462	20596	10758	3550	209	0.2352	Y
31020	9000	7.95	7.31	6.82	6.13	5.41	4.15	2.28	60	2288542	19354	11389	3758	209	0.2399	Y
31040	9000	7.75	7.20	6.75	6.12	5.42	4.22	2.40	61	2557389	19864	10757	3550	209	0.2314	Y
34060	9000	6.91	6.41	6.02	5.44	4.81	3.77	2.15	61	2823704	23813	11837	3906	209	0.27	Y
31080	9000	7.43	6.88	6.43	5.79	5.11	3.97	2.27	61	2389767	25602	10989	3626	209	0.3392	Y
31100	9000	7.53	7.00	6.55	5.92	5.24	4.08	2.32	61	2563038	22014	10957	3616	209	0.2784	Y
									61	2560669	21730	11058	3649	209	0.28	
										200844	2469	568	187	0	0.10	
										8%	11%	5%	5%	0%	34%	
s2l4																
30960	9000	9.13	8.40	7.85	6.98	6.15	4.68	2.63	50	1855136	16324	12160	4013	313	0.0989	Y
30980	9000	8.24	7.63	7.09	6.39	5.63	4.35	2.47	44	2221581	17091	13072	4314	313	0.2953	Y
31000	9000	8.84	8.19	7.63	6.88	6.00	4.58	2.53	43	2072002	13634	13117	4329	313	0.3379	Y
31020	9000	8.35	7.81	7.33	6.65	5.88	4.60	2.63	44	2539174	13165	12812	4228	313	0.303	Y
31040	9000	7.77	7.19	6.77	6.12	5.41	4.22	2.43	43	2574737	16919	13397	4421	313	0.2578	Y

34060	9000	8.36	7.81	7.32	6.61	5.88	4.59	2.64	44	2466365	14550	12498	4124	313	0.2376	Y
31080	9000	7.77	7.16	6.67	6.03	5.31	4.17	2.42	43	2339259	22006	12846	4239	313	0.6017	Y
31100	9000	7.74	7.19	6.73	6.09	5.38	4.25	2.46	43	2571608	18538	12993	4288	313	0.5045	Y
										2329983	**16528**	**12862**	**4244**	**313**	**0.33**	
										263091	**2882**	**386**	**127**	**0**	**0.16**	
										11%	**17%**	**3%**	**3%**	**0%**	**48%**	
Michback	Filename:															
Control	Section:	**83053**														
Job	Number:	**57994**														
Route:		**US-24**	NB													
Lane:			2E10	Base												
Region:		**Metro**														
Trial	Number:	1		**4.5" Bit.(2E10), 12" Base Aggregate, 14 " Sand Subbase**												
Units:	Load:	lb	Deflection:	in.	Temp.	F	Modulus:	psi			**Base/**		**AASHTO**	**Depth**		
									Temp.	**Bit.**	**Subbase**	**Subgrade**	**Corrected**	**Stiff**		**Converge**
Sta./Mp	**Load**	**D0**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**Pvmt**	**Modulus**	**Modulus**	**Modulus**	**Mr**	**Layer**	**RMS(%)**	**y/n**
S2l1																
30960	9000	34.57	20.21	13.07	8.77	6.49	3.91	1.86	131	80110	15366	15377	5074	430	4.4155	Y
30980	9000	31.98	19.16	12.57	8.17	5.89	3.54	1.89	131	82320	16682	16158	5332	430	1.5611	Y
31000	9000	33.45	18.79	11.07	6.52	4.83	3.26	1.82	136	44517	19169	17949	5923	430	5.6002	Y
31020	9000	31.13	17.13	11.05	7.21	5.37	3.22	1.77	135	61115	19425	17527	5784	430	1.8645	Y
31040	9000	28.95	16.73	10.89	7.53	5.48	3.19	1.69	132	85711	19112	17768	5863	430	3.3463	Y
31080	9000	27.34	16.82	11.29	7.35	5.44	3.19	1.44	124	126438	17442	19211	6340	430	5.2114	Y
31100	9000	29.97	18.18	11.41	6.88	4.74	2.89	1.62	128	71527	17954	19484	6430	430	3.2821	Y
									131	**78820**	**17879**	**17639**	**5821**	**430**	**3.61**	
										25404	**1501**	**1489**	**492**	**0**	**1.56**	
										32%	**8%**	**8%**	**8%**	**0%**	**43%**	
s2l2																
30960	9000	31.43	18.57	11.07	6.25	4.43	3.12	1.97	121	53529	19385	19451	6419	715	8.3148	Y
30980	9000	30.58	18.69	11.05	6.30	4.46	3.03	1.82	120	59442	18827	20169	6656	715	6.9034	Y
31000	9000	34.04	20.72	12.44	7.14	5.17	3.48	2.06	128	52984	17037	17596	5807	715	6.0999	Y
31020	9000	31.91	19.04	11.34	6.46	4.77	3.36	1.98	125	49190	19326	18493	6103	715	7.0428	Y
31040	9000	33.65	18.78	10.99	6.28	4.67	3.31	2.07	127	39795	19984	18449	6088	715	8.0803	Y
31080	9000	28.64	17.07	10.07	5.62	3.97	2.52	1.58	122	65542	19750.	23548	7771	715	6.9107	Y
31100	9000	26.48	16.86	10.46	6.30	4.52	2.83	1.57	116	96201	19350	21775	7186	715	3.4382	Y
8	9000	30.72	18.67	11.14	6.04	4.15	2.80	1.72	119	51191	18794	21491	7092	715	7.9623	Y
									122	**58484**	**19057**	**20122**	**6640**	**715**	**6.84**	
										16975	**911**	**2022**	**667**	**0**	**1.56**	
										29%	**5%**	**10%**	**10%**	**0%**	**23%**	

US-24 NB Perpetual Pavement Demo Project

Control Section 83053 Job Number 57994

TTI MODULUS ANALYSIS SYSTEM (SUMMARY REPORT) (Version 5.1)

S2L1	Wearing				
District: 9			MODULI RANGE(psi)		
County: 999		Thickness(in)	Minimum	Maximum	Poisson Ratio Values
Highway/Road:US24NB	Pavement:	10	100,000	2,000,000	H1: ō = 0.35
	Base:	14	10,000	500,000	H2: ō = 0.40
	Subbase:	12	5,000	100,000	H3: ō = 0.45
	Subgrade:	207.4	9,500		H4: ō = 0.45

Station m	Load lbf	Load Plate D0 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Bit. Layer	Aggregate Base Layer ksi	Sand Subbase Layer ksi	Subgrade Layer ksi	ERR/Sens	Depth to Bedrock inch	AASHTO Corrected Mr psi
29900	9,000	7.13	6.5	6.06	5.51	4.89	3.88	2.25	1420	14.4	14.4	14.4	0.41	221.41	4752
29920	9,000	6.03	5.51	5.18	4.81	4.33	3.54	2.14	1555	61.1	19.9	12.1	0.37	300	3993
29940	9,000	6.39	5.71	5.36	4.95	4.45	3.6	2.16	1764	15.8	18	14.8	1	300	4884
29960	9,000	6.47	5.91	5.53	5.08	4.55	3.64	2.17	1693	15.2	18.1	14.6	0.39	246.87	4818
29980	9,000	6.13	5.56	5.21	4.8	4.32	3.53	2.15	1674	27.8	34.5	12.8	0.5	300	4224
30000	9,000	8	7.36	6.87	6.27	5.55	4.28	2.4	1229	12.9	13.2	12.9	0.59	207.52	4257
30020	9,000	6.44	5.81	5.48	5.03	4.49	3.63	2.16	1662	20.2	18.6	14.1	0.64	236.19	4653
30040	9,000	7.08	6.39	5.94	5.4	4.81	3.79	2.13	1334	13.5	40.4	13.4	0.32	190.82	4422
Mean:		6.71	6.09	5.7	5.23	4.67	3.74	2.2	1541	22.6	22.2	13.6	0.53	243.45	4500
Std. Dev:		0.66	0.63	0.57	0.49	0.41	0.25	0.09	193	16.3	9.8	1	0.22	40.71	324
V of C,%:		9.77	10.27	9.96	9.4	8.77	6.71	4.13	13	72.1	44.4	7.3	42.02	16.72	7.2

s1l2e4	Wearing				
District: 9			MODULI RANGE(psi)		
County: 999		Thickness(in)	Minimum	Maximum	Poisson Ratio Values
Highway/Road:US24NB	Pavement:	10	100,000	2,000,000	H1: ō = 0.35
	Base:	14	10,000	500,000	H2: ō = 0.40
	Subbase:	12	5,000	100,000	H3: ō = 0.45
	Subgrade:	136.5	6,800		H4: ō = 0.45

Station m	Load lbf	Load Plate D0 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Bit. Layer	Aggregate Base Layer ksi	Sand Subbase Layer ksi	Subgrade Layer ksi	ERR/Sens	Depth to Bedrock inch	AASHTO Corrected Mr psi
29900	8,999	8.5	7.58	6.9	6.12	5.26	3.91	2.1	808	20.5	13	12.9	0.57	172.88	4257
29920	8,999	8.69	7.81	7.16	6.31	5.48	4.08	2.17	882	13.7	11.5	13.2	0.39	168.49	4356
29940	8,999	8.73	7.77	7.1	6.26	5.37	3.94	2.06	816	13.6	14.2	13.6	0.44	158.97	4488
29960	8,999	7.67	6.88	6.37	5.72	5	3.8	2.05	1045	13.8	50.5	11.3	0.36	169.77	3729
29980	8,999	6.95	6.21	5.73	5.2	4.59	3.58	1.99	1090	32.7	32.7	10.9	0.36	180.79	3597
30000	8,999	8.01	7.26	6.74	6.14	5.39	4.18	2.3	1206	12.1	12.1	12.1	0.45	185.28	3993
30020	8,999	8.08	7.27	6.72	6	5.27	3.99	2.15	1044	12.3	20.3	12.3	0.18	172.89	4059
30040	8,999	8.52	7.65	7.02	6.28	5.45	4.11	2.21	917	14.7	17.1	11.9	0.43	173.74	3927
Mean:		8.14	7.3	6.72	6	5.23	3.95	2.13	976	16.7	21.4	12.3	0.4	172.53	4051
Std. Dev:		0.61	0.54	0.47	0.38	0.3	0.19	0.1	142	7	13.6	0.9	0.11	7.47	306
V of C,%:		7.46	7.41	7.04	6.28	5.7	4.86	4.67	15	42	63.7	7.4	28.3	4.33	7.6

s1l3	Wearing				
District: 9			MODULI RANGE(psi)		
County: 999		Thickness(in)	Minimum	Maximum	Poisson Ratio Values
Highway/Road:US24NB	Pavement:	10	100,000	2,000,000	H1: ō = 0.35
	Base:	14	10,000	500,000	H2: ō = 0.40
	Subbase:	12	5,000	100,000	H3: ō = 0.45
	Subgrade:	160	6,400		H4: ō = 0.45

Station m	Load lbf	Load Plate D0 mils	D3 mils	D4 mils	D5 mils	D6 mils	D7 mils	D8 mils	Bit. Layer	Aggregate Base Layer ksi	Sand Subbase Layer ksi	Subgrade Layer ksi	ERR/Sens	Depth to Bedrock inch	AASHTO Corrected Mr psi
29900	9,000	8.71	7.92	7.35	6.56	5.71	4.32	2.38	944	10	53	10	0.7	195.59	3300
29920	9,000	7.88	7.26	6.81	6.17	5.48	4.28	2.42	1340	14	9.1	11.4	0.33	210.18	3762
29940	9,000	8.47	7.8	7.3	6.63	5.86	4.54	2.54	1211	12.4	9.9	10.7	0.45	207.75	3531
29960	9,000	9.01	8.39	7.85	7.06	6.16	4.67	2.49	1054	10.5	10.5	10.5	1.16	174.51	3465
29980	9,000	8.02	7.41	6.98	6.4	5.7	4.48	2.55	1303	21.1	11.7	9.5	0.58	220.1	3135
30000	9,000	8.64	7.89	7.4	6.74	5.92	4.59	2.58	1168	12.3	10.3	10.6	0.37	213.05	3498
30020	9,000	8.82	8.11	7.55	6.85	6.01	4.62	2.5	1108	10.8	10.7	10.7	0.5	181.45	3531
30040	9,000	10.09	9.21	8.55	7.67	6.69	5.02	2.66	826	10	25.5	8.9	0.82	177.1	2937
Mean:		8.7	8	7.47	6.76	5.94	4.57	2.51	1119	12.6	17.6	10.3	0.61	196.03	3395
Std. Dev:		0.68	0.61	0.54	0.46	0.37	0.23	0.09	175	3.7	15.3	0.8	0.28	16.86	260
V of C,%:		7.81	7.59	7.22	6.76	6.18	5.04	3.53	16	29.3	86.8	7.9	44.99	8.6	7.7

S1L4	Wearing				
District: 9			MODULI RANGE(psi)		
County: 999		Thickness(in)	Minimum	Maximum	Poisson Ratio Values
Highway/Road:US24NB	Pavement:	10	100,000	2,000,000	H1: ō = 0.35

			Base:	14		10,000 500,000			H2: δ = 0.40						
			Subbase:	12		5,000 100,000			H3: δ = 0.45						
			Subgrade:	154.5		5,700			H4: δ = 0.45						
		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade		Depth to	Corrected
Station	Load	D0	D3	D4	D5	D6	D7	D8	Bit.	Layer	Layer	Layer	ERR/Sens	Bedrock	Mr
m	lbf	mils	mils	mils	mils	mils	mils	mils	Layer	ksi	ksi	ksi		inch	psi
29900	9,000	8.43	7.62	7.08	6.38	5.62	4.33	2.37	1123	11.7	11.5	11.5	0.34	185.23	3795
29920	9,000	9.25	8.32	7.68	6.87	6.04	4.6	2.52	878	13.6	25.4	9.4	0.23	193.72	3102
29940	9,000	9.1	8.25	7.65	6.9	6.04	4.58	2.5	922	15.9	15.7	9.7	0.49	192.07	3201
29960	9,000	8.72	7.91	7.38	6.63	5.81	4.45	2.46	1026	10.1	30.1	10	0.36	197.45	3300
29980	9,000	9.91	8.91	8.23	7.39	6.45	4.92	2.63	786	14.2	29.7	8.2	0.45	177.57	2706
30000	9,000	9.72	8.75	8.15	7.32	6.44	4.93	2.7	847	18.7	13.4	8.8	0.3	197.09	2904
30020	9,000	9.24	8.2	7.61	6.85	6.02	4.61	2.55	843	14.2	55.5	8.1	0.29	201.26	2673
30040	9,000	9.78	8.84	8.19	7.4	6.48	4.95	2.66	865	18.5	8.8	9.4	0.4	182.15	3102
Mean:		9.27	8.35	7.75	6.97	6.11	4.67	2.55	911	14.6	23.8	9.4	0.36	190.49	3098
Std. Dev:		0.52	0.46	0.41	0.37	0.32	0.24	0.11	111	3	15.3	1.1	0.09	7.9	360
V of C,%:		5.64	5.49	5.35	5.36	5.21	5.05	4.32	12	20.6	64.2	11.6	24.22	4.15	11.6
S2L1	Wearing														
District: 9					MODULI RANGE(psi)										
County: 999				Thickness(in)		Minimum Maximum			Poisson Ratio Values						
Highway/Road:US24NB			Pavement:	10		100,000 2,000,000			H1: δ = 0.35						
			Base:	14		10,000 500,000			H2: δ = 0.40						
			Subbase:	12		5,000 100,000			H3: δ = 0.45						
			Subgrade:	138.6		6,600			H4: δ = 0.45						
		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade		Depth to	Corrected
Station	Load	D0	D3	D4	D5	D6	D7	D8	Bit.	Layer	Layer	Layer	ERR/Sens	Bedrock	Mr
m	lbf	mils	mils	mils	mils	mils	mils	mils	Layer	ksi	ksi	ksi		inch	psi
30960	9,000	7.07	6.19	5.71	5.18	4.57	3.59	2.07	925	45.5	41.9	8.9	0.34	211.9	2937
30980	9,000	7.65	6.79	6.23	5.63	4.94	3.8	2.11	942	29.7	29.5	9.7	0.34	188.43	3201
31000	9,000	8.44	7.4	6.74	6.02	5.21	3.9	2.12	791	20.9	30.5	10.3	0.34	180.38	3399
31020	9,000	7.28	6.32	5.82	5.25	4.59	3.52	2	910	25.8	88.4	8.8	0.55	204.56	2904
31040	9,000	7.2	6.32	5.83	5.26	4.62	3.58	1.99	993	32.8	32.1	10.2	0.42	182.48	3366
31060	9,000	7.23	6.28	5.74	5.14	4.46	3.35	1.83	939	24.6	33.6	12.1	0.45	173.66	3993
31080	9,000	8.22	7.19	6.51	5.73	4.9	3.58	1.84	765	20.5	20.6	12.8	0.41	146.27	4224
31100	9,000	7.79	6.76	6.17	5.49	4.69	3.44	1.74	842	19.2	28.8	12.8	0.41	137.26	4224
Mean:		7.61	6.66	6.09	5.46	4.75	3.6	1.96	888	27.4	38.2	10.7	0.41	174.6	3531
Std. Dev:		0.51	0.46	0.38	0.31	0.25	0.18	0.14	80	8.7	21.1	1.6	0.07	25.62	544
V of C,%:		6.68	6.84	6.3	5.71	5.24	4.99	7.27	9	31.7	55.3	15.3	17.41	14.67	15.4
S2L2	Wearing														
District: 9					MODULI RANGE(psi)										
County: 999				Thickness(in)		Minimum Maximum			Poisson Ratio Values						
Highway/Road:US24NB			Pavement:	10		100,000 2,000,000			H1: δ = 0.35						
			Base:	14		10,000 500,000			H2: δ = 0.40						
			Subbase:	12		5,000 100,000			H3: δ = 0.45						
			Subgrade:	165.8		7,900			H4: δ = 0.45						
		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade		Depth to	Corrected
Station	Load	D0	D3	D4	D5	D6	D7	D8	Bit.	Layer	Layer	Layer	ERR/Sens	Bedrock	Mr
m	lbf	mils	mils	mils	mils	mils	mils	mils	Layer	ksi	ksi	ksi		inch	psi
30960	9,000	7.94	6.84	6.26	5.59	4.85	3.64	2.02	744	35	23.5	11.8	0.43	191.94	3894
30980	9,000	6.37	5.64	5.28	4.84	4.34	3.45	2.07	1087	94.4	10.3	11.2	0.46	253.74	3696
31000	9,000	6.76	5.96	5.53	5.15	4.65	3.71	2.15	1005	100.5	10.1	10.1	0.81	216.13	3333
31020	9,000	7.2	6.28	5.76	5.19	4.57	3.54	1.99	892	28.8	96.8	9.3	0.41	191.3	3069
31040	9,000	7.14	6.37	5.88	5.36	4.71	3.67	2.08	1067	32	32	10.7	0.41	199.94	3531
31060	9,000	6.07	5.3	4.88	4.43	3.93	3.06	1.77	1085	59.1	27	13	0.45	205.03	4290
31080	9,000	9.06	7.69	6.93	6.03	5.09	3.62	1.76	616	17.2	21.2	14.4	0.29	127.62	4752
31100	9,000	7.4	6.33	5.78	5.15	4.5	3.35	1.82	796	31.9	37.7	12.4	0.63	172.33	4092
Mean:		7.24	6.3	5.79	5.22	4.58	3.5	1.96	912	49.9	32.3	11.6	0.49	201.8	3832
Std. Dev:		0.94	0.73	0.62	0.48	0.35	0.22	0.15	178	31.7	27.8	1.6	0.16	40.85	544
V of C,%:		12.99	11.66	10.7	9.14	7.57	6.17	7.79	20	63.5	85.9	14.1	32.71	20.24	14.2
S2L3	Wearing														
District: 9					MOMODULI RANGE(psi)										
County: 999			Thick	Thickness(in)		Minimum Maximum			Poisson Ratio Values						
Highway/Road:US24NB			Pavement:	10		100,000 2,000,000			H1: δ = 0.35						
			Base:	14		10,000 500,000			H2: δ = 0.40						
			Subbase:	12		5,000 100,000			H3: δ = 0.45						
			Subgrade:	189.9		8,000			H4: δ = 0.45						
		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade		Depth to	Corrected
Station	Load	D0	D3	D4	D5	D6	D7	D8	Bit.	Layer	Layer	Layer	ERR/Sens	Bedrock	Mr

m	lbf	mils	mils	mils	mils	mils	mils	mils	Layer	ksi	ksi	ksi		inch	psi
30960	9,000	6.83	6.26	5.93	5.45	4.9	4	2.42	1755	16.7	21.3	11	0.44	300	3630
30980	9,000	7.02	6.42	6.06	5.5	4.91	3.91	2.3	1523	17.4	14.9	12.3	0.22	238.64	4059
31000	9,000	7.45	6.73	6.31	5.75	5.09	4.08	2.4	1388	16.3	14.6	12.1	0.65	238.92	3993
31020	9,000	7.44	6.65	6.2	5.65	5.01	3.97	2.29	1102	40.8	12.8	11.4	0.34	218.32	3762
31040	9,000	7.13	6.49	6.11	5.63	5.01	4.04	2.38	1559	18	15.6	11.5	0.58	237.28	3795
31060	9,000	6.68	6	5.63	5.13	4.55	3.61	2.08	1342	38	12.6	12.9	0.37	207.43	4257
31080	9,000	7.18	6.43	6.01	5.46	4.84	3.81	2.21	1177	37.5	12.5	12.2	0.26	224.06	4026
31100	9,000	7.17	6.47	6.03	5.53	4.9	3.86	2.23	1245	35.2	11.7	12	0.3	220.92	3960
Mean:		7.11	6.43	6.03	5.51	4.9	3.91	2.29	1386	27.5	14.5	11.9	0.39	225.94	3935
Std. Dev:		0.27	0.23	0.2	0.19	0.16	0.15	0.11	217	11.2	3.1	0.6	0.15	21.99	198
V of C,%:		3.78	3.51	3.34	3.38	3.33	3.87	4.99	16	40.9	21.1	5.1	38.98	9.73	5.0

S2L4	**Wearing**						
District: 9			MC	MODULI RANGE(psi)			
County: 999		Thick	Thickness(in)	Minimum	Maximum	Poisson Ratio Values	
Highway/Road:US24NB		Pavement:	10	100,000	4,000,000	H1: ō = 0.35	
		Base:	14	10,000	500,000	H2: ō = 0.40	
		Subbase:	12	5,000	100,000	H3: ō = 0.45	
		Subgrade:	264	9,200		H4: ō = 0.45	

		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade	Absolute	Depth to	Correcte...
Station	**Load**	**D0**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**Bit.**	**Layer**	**Layer**	**Layer**	**ERR/Sens**	**Bedrock**	**Mr**
m	**lbf**	**mils**	**mils**	**mils**	**mils**	**mils**	**mils**	**mils**	**Layer**	**ksi**	**ksi**	**ksi**		**inch**	**psi**
30960	9,000	6.16	5.77	5.53	5.09	4.63	3.88	2.5	2131	15.9	96.6	10.5	0.44	300	3465
30980	9,000	6.06	5.66	5.39	5	4.65	3.8	2.41	1966	54.4	13.9	11.6	0.44	300	3828
31000	9,000	6.33	5.89	5.61	5.22	4.74	3.92	2.43	1920	43	12.5	11.7	0.34	300	3861
31020	9,000	6.04	5.6	5.37	4.96	4.53	3.78	2.43	1979	55.1	13.9	11.7	0.31	300	3861
31040	9,000	5.82	5.42	5.18	4.8	4.34	3.59	2.26	2061	47.2	13	12.9	0.52	300	4257
31060	9,000	6.21	5.87	5.6	5.19	4.73	3.93	2.48	2192	21.9	29.4	11.1	0.59	300	3663
31080	9,000	5.6	5.23	5.02	4.66	4.24	3.53	2.28	2406	30.9	21.8	12.7	0.39	300	4191
31100	9,000	5.81	5.42	5.19	4.83	4.38	3.66	2.32	2181	31.9	38	11.3	0.47	300	3729
Mean:		6	5.61	5.36	4.97	4.52	3.76	2.39	2104	37.5	29.9	11.7	0.44	300	3857
Std. Dev:		0.24	0.24	0.22	0.2	0.18	0.15	0.09	159	14.7	28.5	0.8	0.09	0	262
V of C,%:		4.04	4.21	4.03	3.96	4.06	4.05	3.8	8	39.1	95.3	6.8	20.52	0	6.8

S1L3	**Leveling**						
District: 9				MODULI RANGE(psi)			
County: 999			Thickness(in)	Minimum	Maximum	Poisson Ratio Values	
Highway/Road:US24N		Pavement:	7.5	100,000	4,000,001	H1: ō = 0.35	
		Base:	14	10,000	500,000	H2: ō = 0.40	
		Subbase:	12	5,000	100,000	H3: ō = 0.45	
		Subgrade:	112.3	4,400		H4: ō = 0.45	

		Load								Aggregate	Sand				AASHTO
		Plate								Base	Subbase	Subgrade	Absolute	Depth to	Corrected
Station	**Load**	**D0**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**Bit.**	**Layer**	**Layer**	**Layer**	**ERR/Sens**	**Bedrock**	**Mr**
m	**lbf**	**mils**	**mils**	**mils**	**mils**	**mils**	**mils**	**mils**	**Layer**	**ksi**	**ksi**	**ksi**		**inch**	**psi**
29900	9,000	12.81	11.03	9.71	8.05	6.54	4.34	2.16	619	13.8	32.4	9.3	0.33	148.51	3069
29920	9,000	11.48	10.09	9.01	7.72	6.46	4.51	2.29	822	19.7	23.3	8.5	0.32	155.72	2805
29940	9,000	11.88	10.55	9.44	8.04	6.71	4.65	2.31	820	16.7	23.4	8.4	0.4	146.79	2772
29960	9,000	12.57	11.03	9.78	8.25	6.77	4.58	2.25	721	15.9	16.1	9.5	0.48	143.33	3135
29980	9,000	12.19	10.7	9.54	8.07	6.71	4.62	2.32	750	17.6	20.2	8.7	0.32	152.15	2871
30000	9,000	12.71	11.15	9.97	8.47	7.05	4.85	2.39	737	15.7	23	8.1	0.27	145.42	2673
30020	9,000	12.13	10.67	9.52	8.04	6.68	4.56	2.23	793	10.1	93.3	7.7	0.29	140.76	2541
30040	9,000	12.76	11.02	9.73	8.1	6.62	4.38	2.11	630	19.8	10.8	10.6	0.35	135.95	3498
Mean:		12.32	10.78	9.59	8.09	6.69	4.56	2.26	737	16.2	30.3	8.8	0.34	145.84	2921
Std. Dev:		0.48	0.35	0.29	0.21	0.18	0.16	0.09	78	3.2	26.2	0.9	0.07	5.89	303
V of C,%:		3.88	3.26	3	2.62	2.63	3.51	4.01	11	19.8	86.5	10.6	19.59	4.04	10.4

Pavement Structural Design Recommendations For Telegraph Road – US-24

Report No. 3104

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September 2001

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Pavement Structural Design Recommendations For Telegraph Road – US-24

September 2001

Introduction

The Michigan Asphalt Pavement Association (MAPA) requested a pavement structural design using mechanistic-empirical methods for the section to be reconstructed along Telegraph Road (US-24). This section is in the northbound lane from I-96 to Grand River Avenue (BMP 5.93 to EMP 8.63). The purpose of this document is to present the computations and analyses completed to provide the layer thickness recommendations for the reconstruction of Telegraph Road.

Study Objective

The objective of this design study was to provide pavement designs and cross-sections for the section along Telegraph Road (US-24) that is to be reconstructed using the same mechanistic-empirical methods that were used to prepare "A Simplified Catalog of Solutions."

Project Assumptions

The following design assumptions and features were used in this analysis study and were obtained from the design documents provided by MDOT and MAPA relative the pavement design for Telegraph Road using the AASHTO DARWIN program.

- Design life = 20 years
- Design traffic = 3,731,650 18-kip Equivalent Single Axle Loads (ESALs)
- Design subgrade modulus = 3,000 psi
- Change in Serviceability = 2.0
- Standard deviation = 0.49
- Reliability = 95 percent
- Equivalent Annual HMA Modulus = 450,000 psi

Subsurface Investigations – Soil Support

Nineteen boring logs provided by MDOT were reviewed to determine the types of soils along this project. Borings 92-95 and 100-104 represent the specific location for the area included in this demonstration project.

The soils along this portion of Telegraph Road consist of moderately compact fine sands over low plasticity silty-sandy clays. Based on the boring logs and gradation test results provided, the subgrade soils encountered along the section of Telegraph Road included in the demonstration project are believed to have a frost susceptibility classification of moderate to high using the Corps of Engineers classification system (refer to Figure 1).(1) It is suggested that a non-frost susceptible material be placed above the subgrade to minimize the potential for frost heave over time. Thus, a minimum of 36 inches (914 mm) of non-frost susceptible materials were included in the pavement cross-sections analyzed in this study.

Another important observation from information included on the boring logs is the notation of brick that was encountered in boring 94. This material recovered in the boring suggests that an uncontrolled fill may have been placed along this portion of the project. It is recommended that the densities and other physical properties of the supporting foundation layers be checked to ensure that highly variable materials do not exist below this portion of the project. As a minimum, project level deflection basin tests should be conducted along the project to estimate the level of variability of the supporting soils. The design study reported herein assumes that the supporting foundation layers are relatively uniform without variable conditions that can exist for uncontrolled fills.

Mechanistic-Empirical Thickness Design Method

The structural deterioration of flexible pavements is associated with cracking of the HMA surface, and/or development of ruts in the wheel path. The methodology used in this study, applies the cumulative damage concept in the prediction of these two modes of distress. Use of the cumulative damage concept permits accounting, in a rational manner, for damage caused by each load application.

Seasonal and other variations in material properties and modulus of each layer with different loads can be considered in these predictions of damage. Evaluations of design life for candidate pavement structures are based on computations of damage caused by each truck type and load (or an 18-kip equivalent single axle load) for different seasons of the year, and summing the results to obtain the total damage to the pavement structure. For this design study, however, the truck traffic distribution and the elastic modulus versus temperature for the specific HMA mixture were unavailable. Thus, an equivalent annual modulus for similar mixtures was used in the design study.

The objective of this design effort was to provide pavement structures that will serve the design traffic levels projected through a design period before experiencing failure.

Failure of flexible pavements is defined as alligator cracking over 10 percent of the area subjected to wheels or one-half inch of rutting. The failure of a pavement system under this concept is assumed to occur when the damage index reaches a fixed amount, generally 1.0. It should be understood that a damage index of one does not necessarily imply a functional failure, but is instead that level of damage selected as sufficient to warrant maintenance and/or rehabilitation.

For this study, a damage index of one means the pavement has been subjected to a sufficient number of wheel loads to cause 10 percent alligator cracking of moderate to high severity or 0.5 inches of rut depth (as defined by the SHRP *Pavement Distress Identification Manual*). These values of 10 percent cracking and 0.5-inch rut depth were selected, because previous studies of in-service pavements have indicated that these levels will usually trigger some type of pavement rehabilitation.

Two other criteria were used for the mechanistic-empirical thickness design checks. One is based on limiting the maximum surface deflection and the other is based on limiting the modulus ratio between two adjacent unbound pavement layers. These two criteria and the rutting and fatigue criteria used for the design checks are listed and summarized in Table 1.

Table 1. Limiting criteria that were used to determine the layer thickness requirements for a design traffic level of 3,731,650 ESALs.

Design Criteria		Limiting Value
Tensile strain at the bottom of the HMA layers, in./in.		0.000145
Vertical compressive strain, in./in.	Top of the embankment material	0.000409
	Top of the subgrade soil	0.000341
Maximum surface deflection, in.	Thick unbound granular base/ subbase layers	0.0255
	Full-depth or deep strength HMA pavements	0.0230
Unbound layer modulus ratios		Layer Thickness and Layer Modulus Dependent

Pavement Structural Designs

The pavement layer thickness and material types were based on mechanistic-empirical techniques, in accordance with the following assumptions and design features.

- The pavement structural response model used to calculate pavement responses was based on elastic layer theory.
- The layer thickness for the pavement structure was based on using the design criteria for fatigue cracking (limiting the tensile strain at the bottom of the HMA layers) and subgrade distortion (limiting the vertical compressive strain at the top of the subgrade) as noted in Table 1.
- Design life = 20 years
- Cumulative traffic = 3,731,650 Equivalent Single Axle Loads (ESALs)
- Tire load = 4,500 lbs per tire.
- Tire pressure = 100 psi
- Non-Frost Embankment Material; Modulus = 6,500 psi
- Sand Subbase; E = 10,000 psi (layer thickness dependent)
- Aggregate Subbase (22A); E = 15,000 psi (layer thickness dependent)
- Aggregate Bases (21AA); E = 20,000 psi (layer thickness dependent)

The resilient modulus of pavement materials and soils is determined or measured from repeated load triaxial tests. The resilient modulus of the unbound pavement materials is a parameter that can have a significant impact on the HMA layer thickness. Resilient modulus tests were unavailable for this design study. However, resilient modulus tests were completed and were available for the FHWA Long Term Pavement Performance (LTPP) test sections in Michigan. The resilient modulus tests completed on unbound aggregate materials recovered from the Michigan test sections were extracted from the LTPP database for both the base and subbase materials and used to determine the values assumed in the above list.

The long-term in place modulus of unbound base and subbase layers are dependent on the modulus of the supporting layer because of potential de-compaction in the lower portion of these layers. The Corp of Engineers developed criteria to limit the modulus of unbound aggregate layers based on the thickness of that layer and the modulus of the supporting layer.(2) This limiting modulus ratio criteria was used in determining the modulus of the unbound aggregate base and subbase layers.

All designs assume that a subsurface drainage system will be constructed as recommended in the original design study to ensure that the unbound aggregate layers, embankment, and soils will not become saturated for extended periods of time. This recommendation and design study feature is based on the information recovered from the boring logs and reported by the Department for the supporting soils.

For this climatic area, the Department also requires that 36 inches of non-frost susceptible material be placed above any frost-susceptible soil based on historical data and experience. The thickness of non-frost susceptible material requirement was assumed for this design study and not re-evaluated.

Evaluation of the Existing Sand Subbase

One of the design strategies proposed for consideration is to reuse the sand beneath the concrete slabs. The Michigan DOT performed a sieve analysis on the sand recovered from borings 93, 95, 100, and 102. Four of the seven tests failed to meet the Class IIA specification. Some of the samples had more than 25 percent passing the No. 200 sieve. As the moisture content increases with this amount of fines, the strength or modulus of the sand will significantly decrease. The Department did not measure the in-place moisture content and dry density of the sand, or at least these volumetric properties were not provided.

The LTPP database was used to extract all resilient modulus testing performed on soils classified as sands and on sand subbases. Figures 2-5 graphically present the distribution of the resilient modulus measured at specific stress states. It is important to note that the distributions appear to be normal for those groups with a sufficient number of tests.

Table 2 summarizes the median resilient modulus values from Figures 2-5. As tabulated, the median resilient modulus for the sand subbase material is about 18,500 psi for all tests, as well as the tests for samples recovered from only the Michigan sites. The median resilient modulus for the sand subgrade with a larger amount of minus 200-material is about 8,000 psi for all tests and those recovered from the Michigan sites.

A value of 10,000 psi was assumed for the sand subbase material, as summarized above. This value is believed to be reasonable for Class IIA sand subbases and bases assuming that the material does not become saturated nor contaminated with fines. However, the sieve analyses indicate that the sand along the project site contains a level of fines in areas that would result in a significant loss of stiffness or resilient modulus. It is expected that the sand supporting the PCC slabs would have a resilient modulus significantly less than a value of 10,000 psi based of the gradation tests provided by the Department.

To confirm that the existing sand subbase beneath the concrete slabs has a resilient modulus greater than the design resilient modulus for the supporting soil (3,000 psi) and certainly for an assumed value of 10,000 psi, repeated load resilient modulus tests should be performed or deflections measured with the Falling Weight Deflectometer (FWD) and the modulus back-calculated from the deflection basin data. The dynamic cone penetrometer can also be used to estimate the in-place resilient modulus of the sand layer. The use of FWD deflection basins is preferred, because of the greater extent of coverage along both directions.

Table 2. The median resilient modulus measured on the sand subbases and sand subgrades recovered from all of the LTPP sites and from those sites that are located in Michigan.

Material/Layer	Stress State	Median Resilient Modulus, psi (Refer to Figures 2-5)	
		All LTPP Sites	LTPP Sites in Michigan
Sand Subbase	Confinement = 10 psi Cyclic Stress = 9 psi	18,400 (N=62)*	18,700 (N=10)
Sand Subgrade	Confinement = 2.0 psi Cyclic Stress = 1.8 psi	7,700 (N=440)	8,300 (N=7)

* N = number of resilient modulus tests within each group.

Without any of these confirmation tests, it is recommended that the design resilient modulus value recommended for use by the Department be used for the mechanistic-empirical design study. Thus, as noted above, a design resilient modulus of 3,000 psi was used in this design study and is representative of the existing sand material that may not be removed during reconstruction of this segment of Telegraph Road.

It is expected that the strength of the sand will vary during the year or from season to season, because it is frost susceptible. For long-life HMA pavements, the sand material found along this section of Telegraph Road should be protected from frost penetration and freeze-thaw cycles. The sand could be stabilized with Portland cement to reduce its frost susceptibility and improve on the strength of that material.

Evaluation of AASHTO Based Empirical Design - DARWIN

The design-cross section for Telegraph Road was evaluated using the same mechanistic-empirical techniques discussed above. Table 3 summarizes the results of the computations for two conditions – using the elastic layer modulus values for each material that was applied in the DARWIN program and the elastic layer modulus values considering the limitation on layer modulus ratios.

As shown, both conditions do not satisfy the design traffic level of 3.73 MESALs. It is important to note that all computed values exceed all criteria listed in Table 1 when considering the limit on layer modulus ratios of adjacent unbound layers. Thus, it is expected that the design based on the AASHTO procedure will not meet the 20-year traffic levels expected for this roadway.

Table 3. Summary of pavement responses for the layer thickness determined in accordance with the AASHTO-based empirical design procedure.

Layer – Pavement Response	Layer Thickness, inches	Layer Elastic Modulus Assumption	
		Assumed with DARWIN-based designs.	Based on Modulus Ratios of adjacent unbound layers.
Pavement Structure			
Wearing surface & binder layers	4.4	390,000 psi	390,000 psi
HMA base layer	4.0	275,000 psi	275,000 psi
Aggregate base layer	6.3	30,000 psi	20,000 psi
Sand subbase layer	18.1	13,500 psi	10,000 psi
Subgrade soil	---	3,000 psi	3,000 psi
Computations of Pavement Response			
Tensile Strain, Bottom of HMA Base Layer, in./in.		0.000179	0.000208
Vertical Compressive Strain, Top of Soil, in./in.		0.000318	0.000350
Maximum Surface Deflection, in.		0.0283	0.0309
Number of Allowable 18-kip MESALs.		2.75	0.31

Recommended Design – Layer Thickness and Material Types

The design with frost protection is suggested for the reconstruction of Telegraph Road (refer to Table 4). The thickness of the unbound aggregate layers was selected to maximize the strength and stiffness of these materials in order to reduce the overall thickness requirement, while meeting the maximum deflection criteria. Table 5 summarizes the calculated responses for different pavement cross sections using typical pavement materials. Selection of the specific cross section would depend on the availability of local aggregate materials to the project site. Table 6 lists the total HMA thickness and thickness of the individual HMA layers needed for the 20-year design traffic level for the cross sections included in Table 5.

As stated above, one of the design strategies for consideration is to reuse the sand beneath the concrete slabs in place of the sand subbase included in table 5. If the existing sand is used as a part of the HMA pavement structure, it should be treated or stabilized with Portland cement or other suitable material. The use of Portland cement will increase the sand's strength and stiffness. However, no significant reduction in the pavement structural layer thickness can be made because the maximum deflection controls the design (refer to table 5). For Design Option 1, the 19-inch non-frost susceptible layer can be replaced with a 13-inch layer of in-place cement stabilization of the existing sand beneath the PCC slabs. This option should not be used unless sufficient testing is completed to determine the amount of cement to increase the modulus of the existing to a value of 10,000 psi and to reduce the frost-susceptibility of the sand.

Another option that is considered feasible is to stabilize the top portion of the aggregate subbase, 22A (design cross section 1) – a "black base or subbase." For this option, the pavement structure would consist of 9.5 inches of HMA, 6.0 inches of a black subbase, 9.0 inches of an aggregate subbase (22A), and 13 inches of a non-frost susceptible embankment.

Design Option 3, provided in Table 4, is recommended for the demonstration project to reconstruct Telegraph Road because it has the lowest tensile strain at the bottom of the HMA layer and the minimum overall pavement thickness that satisfies the 36-inch non-frost susceptible material above the frost susceptible soil. Design Option 3 is also summarized in Tables 5 and 6 along with more specific details for each of the HMA layers. It is recommended that sufficient testing be completed during construction to ensure that the design assumptions are satisfied. As summarized in Table 4, Design Option 3 includes a geo-textile fabric to prevent intrusion or contamination of fines into the dense-graded aggregate base layer.

Table 4. Design Option 3: Pavement cross-section recommended for the demonstration project – reconstruction of Telegraph Road.

Layer	Material	Layer Thickness, inches
Wearing Surface	Superpave Dense-Graded or Gap-Graded Mixture, 4E10 mix with a PG 70-28 asphalt binder designed at 4 percent air voids, roadway density – 93 to 95 percent.	2.5
HMA Binder	Superpave Binder or Leveling Mixture, 3E10 mix with a PG 70-22 asphalt binder designed at 4 percent air voids, roadway density – 93 to 95 percent.	3.0
HMA Base	HMA Base Mixture, 2E10 mix with a PG 70-22 asphalt binder designed at 3 percent air voids with a higher minimum VMA (1 percent above current minimum), roadway density – 94 to 96 percent.	4.5
Base	Dense-Graded Aggregate Base, 21AA	12.0
	Geo-textile separator between base & subbase.	---
Subbase	Sand	14.0
Total Pavement Thickness		36.0

Table 5. Summary of pavement responses and layer thickness options for the reconstruction of Telegraph Road.

Design Cross-Section	1	2	3	4	5	6	7
Total HMA Thickness, inches	10.0	9.5	10.0	9.6	9.5	9.0	9.0
Crushed Stone Aggr. Base, 21AA, inches	---	----	12.0	12.0	14.0	12.0	15.0
Aggregate Subbase, 22A, inches	15.0	15.0	---	---	---	---	---
Sand Subbase, Non-Frost Susceptible	---	---	14.0	15.5	13.0	18.0	15.0
Non-Frost Susceptible Embankment, inches	19.0	28.0	---	---	---	---	---
Total Pavement Thickness, inches	**44.0**	**52.5**	**36.0**	**37.1**	**36.5**	**39.0**	**39.0**
Tensile Strain, Bottom of HMA Layer, in./in.	0.000133	0.000141	0.000127	0.000132	0.000133	0.000134	0.000140
Vertical Compressive Strain, Top of Soil, in./in.	0.000211	0.000178	0.000252	0.000250	0.000255	0.000257	0.000244
Maximum Deflection, inches	0.0254	0.0253	0.0253	0.0253	0.0253	0.0254	0.0253

Table 6. Total HMA thickness and thickness of the individual HMA layers needed for the cumulative traffic level for a 20-year design period.

Design Cross Section	1	2	3	4	5	6	7
Total HMA Thickness, in.	10.0	9.5	10.0	9.6	9.5	9.0	9.0
Superpave Dense Graded or Gap-Graded Mixture, in.	2.5	2.5	2.5	2.5	2.5	2.5	2.5
HMA Binder Mixture, in.	3.0	2.5	3.0	2.6	2.5	2.5	2.5
HMA Base Mixture, in.	4.5	4.5	4.5	4.5	4.5	4.0	4.0

The HMA was assumed to have specific mixture fracture characteristics. Figure 6 graphically illustrates the minimum tensile strains at failure as a function of the resilient modulus measured using indirect tensile testing methods in accordance with the procedure recommended by Von Quintus, et al.[5] The fatigue cracking criteria used in the design study corresponds to the relationship identified as NCHRP 1-10B in Figure 6. The procedure used for determining the resilient modulus of each unbound pavement layer was in accordance with the steps outlined by Von Quintus and Killingsworth.[3,4]

The asphalt binder used in the Superpave surface, binder and base HMA layers should meet the requirements for the Superpave Performance-Graded (PG) asphalt cements. This should reduce the potential for transverse cracking and permanent deformation of the surface and underlying layers. The Superpave volumetric mixture design method was developed under the Asphalt Research Program of the Strategic Highway Research Program (SHRP), and is composed of two basic parts. The first part is for identifying the binder requirements or determining the temperature range of a binder based on thermal cracking and rutting. The second part is for designing the HMA mixture based on volumetric and aggregate properties. The selection of the specific PG binder in the HMA surface, binder or base layers should be determined from actual test results during the mixture design process.

The design air void content for the wearing surface and binder or leveling layers should be 4 percent to be consistent with the Superpave volumetric mixture design procedure.

The design air void content for the HMA base course or first layer of HMA placed should be 3 percent and the layer should be adequately compacted. This will result in a "binder rich" layer with low air voids, providing a pavement structure with increased resistance to fatigue cracks initiating at the bottom of the HMA layer. Use of this concept to increase the flexibility of the lower HMA base layer should increase the "classical" fatigue strength of the HMA pavement structure and reduce the occurrence of fatigue cracks initiating at the bottom of the HMA layer with time. In other words, an increase in the fatigue strength of the pavement will result in a pavement that will handle a greater number of 18-kip ESALs. The mixture design concept has been used in Europe with good success.[6]

Limitations

All work performed under this study was conducted in accordance with generally accepted pavement engineering practices using data and project information provided by the Michigan Asphalt Pavement Association. No other warranty, express or implied, is made. The generalized pavement thickness design recommendations presented herein were based upon the assumed subsurface and material conditions identified in the report. Sufficient testing should be completed during construction for quality control purposes and to confirm the design values assumed for this design study.

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2. Barker, W. R. and W. N. Brabston, "Development of a Structural Design Procedure for Flexible Airport Pavements," FAA Report No. FAA-RD-74-199, U.S. Army Engineer Waterways Experiment Station, Federal Aviation Administration, September 1975.

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4. Von Quintus, Harold and Brian Killingsworth, *Design Pamphlet for the Determination of Layered Elastic Moduli for Flexible Pavement Design*, Publication No. FHWA-RD-97-077, Federal Highway Administration, Washington, DC, June 1997.

5. Von Quintus, H.L., J.A. Scherocman, C.S. Hughes and T.W. Kennedy, *Asphalt-Aggregate Mixture Analysis System-AAMAS*, NCHRP Report No. 338, National

Cooperative Highway Research Program, National Research Council, Washington, DC, March 1991.

6. Nunn, Michael, "Design of long-Life Roads for Heavy Traffic," Transport Research Laboratory, United Kingdom, Australian Asphalt Pavement Association Industry Conference, 1998.

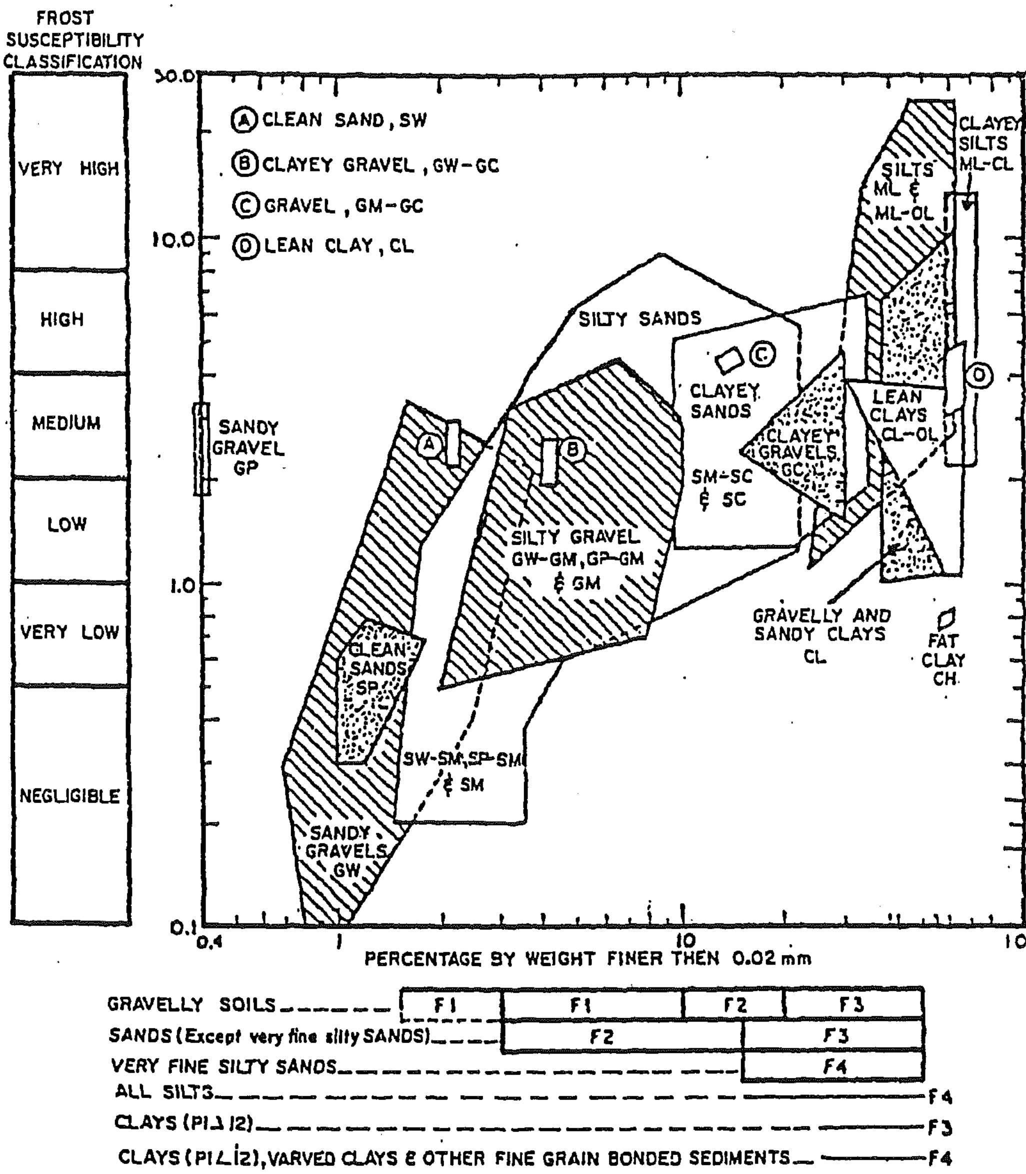
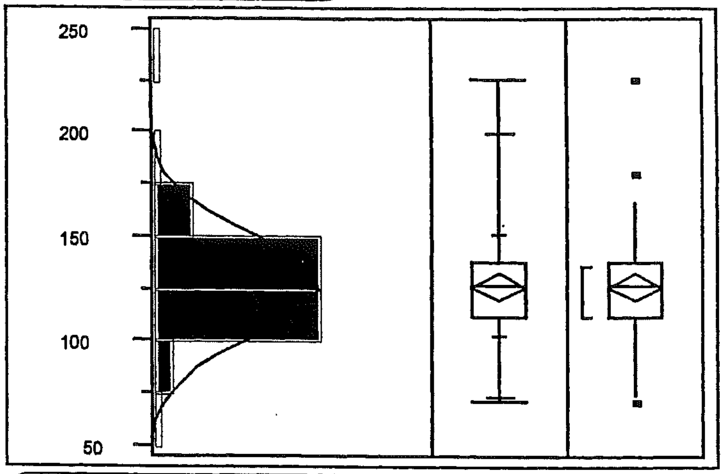


Figure 1. Average rate of heave versus percentage finer than 0.02 mm for natural soil gradations.[1]

Distribution of Average resilient Modulus for GSGB(Sand).

RES_MOD_AVG



Quantiles

maximum	100.0%	226.00
	99.5%	226.00
	97.5%	200.12
	90.0%	151.70
quartile	75.0%	138.00
median	50.0%	127.00
quartile	25.0%	112.00
	10.0%	103.30
	2.5%	73.72
	0.5%	72.00
minimum	0.0%	72.00

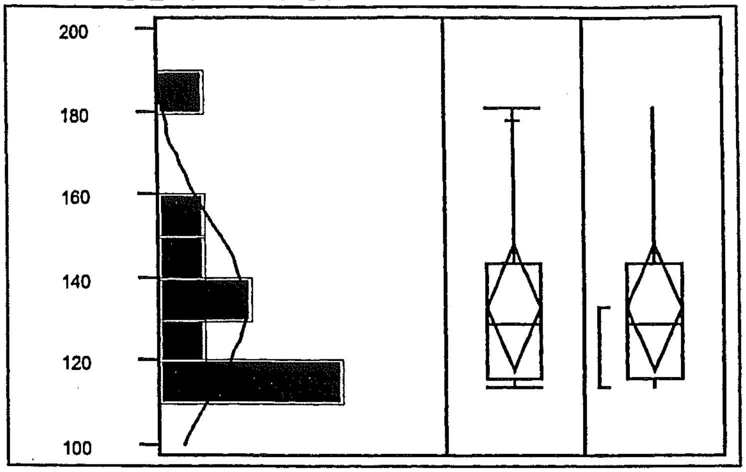
Moments

Mean	126.7581
Std Dev	24.4612
Std Error Mean	3.1066
Upper 95% Mean	132.9700
Lower 95% Mean	120.5461
N	62.0000
Sum Weights	62.0000

Figure 2. Resilient modulus (in kPa) measured on sand base and subbase materials recovered from all sites in the LTPP program for a confining pressure of 10 psi (69 kPa) and a cyclic stress of 9 psi (61kPa). The resilient modulus values given above are in kPa.

Distribution of Average resilient Modulus for GSGB(Sand) for Michigan sites.

RES_MOD_AVG



Quantiles

maximum	100.0%	181.00
	99.5%	181.00
	97.5%	181.00
	90.0%	178.10
quartile	75.0%	143.75
median	50.0%	129.00
quartile	25.0%	115.75
	10.0%	114.10
	2.5%	114.00
	0.5%	114.00
minimum	0.0%	114.00

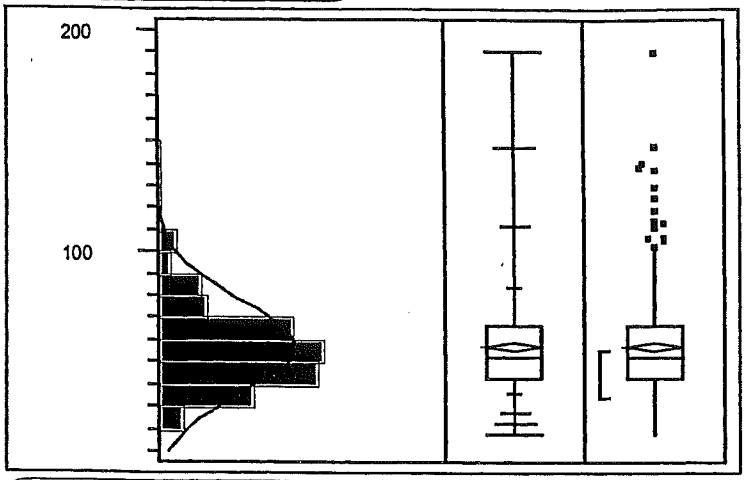
Moments

Mean	133.2000
Std Dev	21.1019
Std Error Mean	6.6730
Upper 95% Mean	148.2955
Lower 95% Mean	118.1045
N	10.0000
Sum Weights	10.0000

Figure 3. Resilient modulus (in kPa) measured on sand base and subbase materials recovered from all Michigan sites included in the LTPP program for a confining pressure of 10 psi (69 kPa) and a cyclic stress of 9 psi (61 kPa). The resilient modulus values given above are in kPa.

Distribution of Average resilient Modulus Subgrade Sand.

RES_MOD_AVG



Quantiles

maximum	100.0%	191.00
	99.5%	147.36
	97.5%	111.87
	90.0%	84.00
quartile	75.0%	67.00
median	50.0%	53.00
quartile	25.0%	43.00
	10.0%	36.00
	2.5%	28.00
	0.5%	23.00
minimum	0.0%	18.00

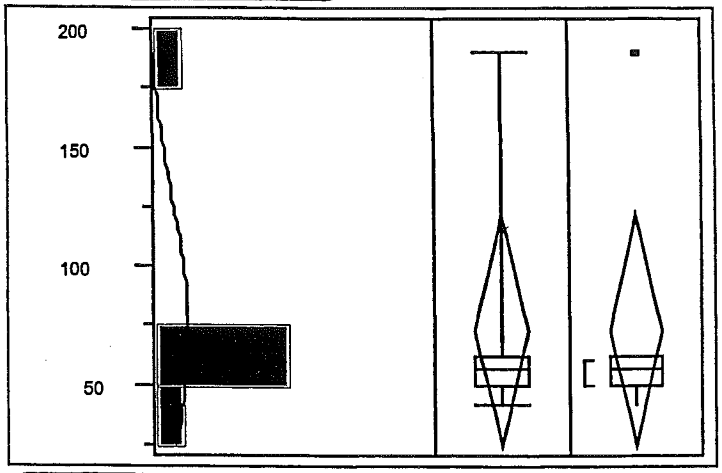
Moments

Mean	57.6341
Std Dev	21.3246
Std Error Mean	1.0166
Upper 95% Mean	59.6321
Lower 95% Mean	55.6360
N	440.0000
Sum Weights	440.0000

Figure 4. Resilient modulus (in kPa) measured on sand recovered from the subgrade at all sites in the LTPP program for a confining pressure of 2.0 psi (13.8 kPa) and a cyclic stress of 1.8 psi (12.3 kPa). The resilient modulus values given above are in kPa.

Distribution of Average resilient Modulus for Sugrade Sand for Michigan sites.

RES_MOD_AVG



Quantiles

maximum	100.0%	191.00
	99.5%	191.00
	97.5%	191.00
	90.0%	191.00
quartile	75.0%	63.00
median	50.0%	57.00
quartile	25.0%	50.00
	10.0%	42.00
	2.5%	42.00
	0.5%	42.00
minimum	0.0%	42.00

Moments

Mean	73.4286
Std Dev	52.3477
Std Error Mean	19.7856
Upper 95% Mean	121.8422
Lower 95% Mean	25.0150
N	7.0000
Sum Weights	7.0000

Figure 5. Resilient modulus (in kPa) measured on sand recovered from the subgrade at all Michigan sites included in the LTPP program for a confining pressure of 2.0 psi (13.8 kPa) and a cyclic stress of 1.8 psi (12.3 kPa). The resilient modulus values given above are in kPa.

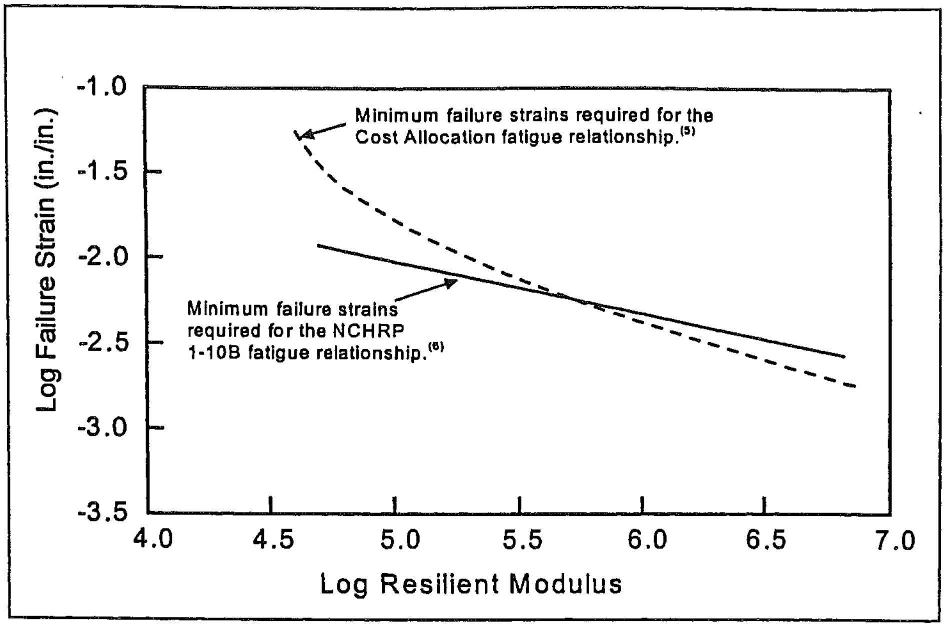


Figure 6. Relationship between minimum tensile failure strains and indirect tensile resilient modulus.[5]