# PAVEMENT EVALUATION REPORT
# I-575 from Barrett Parkway to Sixes Road
# Northwest Corridor Project

GDOT Project No. CSNHS-0008-00(256)
PI No. 0008256
Cobb & Cherokee Counties, Georgia

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**WILLMER ENGINEERING INC.**
Willmer Project No. ATL-171-3099K

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Prepared For

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March 4, 2008

**VIA COURIER**

Pete M. McMahon, PE
Georgia Transportation Partners
c/o PBS&J, Inc.
5665 New Northside Drive, Suite 400
Atlanta, Georgia 30328

**SUBJECT:** **Pavement Evaluation Report**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**
GDOT Project No. CSNHS-0008-00(256), PI No. 0008256
Cobb and Cherokee Counties, Georgia
Willmer Project No. ATL-171-3099K

Dear Mr. McMahon:

Willmer Engineering Inc. (Willmer) is pleased to provide this Pavement Evaluation report for the proposed widening of I-575 from Barrett Parkway in Cobb County to Sixes Road in Cherokee County, Georgia. The Pavement Evaluation was performed in general accordance with our contract with Georgia Transportation Partners (GTP), dated May 12, 2007. This report was prepared in general accordance with Georgia Department of Transportation (GDOT) guidance documents for pavement evaluation and consultations with GDOT Office of Materials and Research personnel. This report was revised to incorporate GTP comments dated January 30 and 31, 2008.

The attached summary presents the existing pavement conditions along the project alignment, and our recommendations for the design of new pavements and pavement overlays.

We appreciate the opportunity to be of service to you on this project and look forward to a continuing relationship. Please contact us if you have any questions concerning this report or require further assistance.

Sincerely,

**WILLMER ENGINEERING INC.**

Paul Zhang, PE
Senior Geotechnical Engineer

Sujit K. Bhowmik, PhD, PE
Principal Geotechnical Consultant

James L. Willmer, PE
Vice President/Principal Consultant

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Revision History:

| Revision | Issue Date | Document Status |
|---|---|---|
| A | January 25, 2008 | Issued for Review |
| 0 | March 4, 2008 | Issued for Use |

**PAVEMENT EVALUATION SUMMARY**
**for**
**GDOT Project No. CSNHS-0008-00(256); PI No. 0008256**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**
**Cobb & Cherokee Counties, Georgia**

**1. Location / Description**

This project consists of widening and reconstruction of the portion of I-575 extending from about 300 feet south of Ernest Barrett Parkway in Cobb County to about 600 feet north of Sixes Road in Cherokee County, Georgia. The construction work for this project begins at Station 80+00 (approximate Mile Post 0.92) in Cobb County and continues north to Station 759+00 (approximate Mile Post 11.35) in Cherokee County, Georgia. The mainline length of this project is about 10.4 miles. A project location map is presented in Figure 1, and a project alignment map is presented in Figure 2.

The existing I-575 is a four-lane divided, controlled access highway with paved outside shoulders, drainage ditches on the sides, and a lowered grassed median. There are two lanes in each direction of I-575 with the exception of the sections between Chastain Road and Bells Ferry Road, and between SR 92 and Towne Lake Parkway, where a third lane exists in both directions.

Based on a set of conceptual drawings provided to us by GTP, we understand that the proposed I-575 is planned to be a six-lane divided, controlled access highway with drainage ditches on both sides and no center median. There will be three lanes in each direction of the proposed widened I-575. The inner lane in each direction is planned to be a high occupancy vehicle (HOV) lane with paved shoulders. The two outer lanes in each direction are planned to be general purpose lanes with paved shoulders on both sides. The HOV lanes will be separated from the general purpose lanes by concrete barriers. We understand that the existing asphalt pavement of the inner lanes is planned to be demolished and new asphalt pavement constructed, while the existing pavement of the outer lanes is planned to be retained depending on its condition and overlaid by new asphalt pavement.

**2. Historical Data**

A historical data search was performed during this study. The GDOT Office of Road & Airport Design was contacted for available as-built pavement data for the existing I-575 from Barrett Parkway to Sixes Road.

Based on as-built drawings dated December 11, 1980, the portion of I-575 from I-75 interchange in Cobb County to just north of SR 92 interchange in Cherokee County was initially constructed with 14 inches of asphaltic concrete underlain by 12 inches of crushed aggregate base. This portion of I-575 was designed with 24 feet wide travel lanes with 10 feet wide paved outside shoulders and 4 feet wide paved inside shoulders.

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**2. Historical Data (continued)**

Based on as-built drawings dated November 13, 1981, the portion of I-575 from just north of SR 92 interchange to Sixes Road in Cherokee County was initially constructed with 12.5 inches of asphaltic concrete underlain by 10 inches of crushed aggregate base. Similar to the portion south of SR 92, this portion of I-575 was designed with 24 feet wide travel lanes with 10 feet wide paved outside shoulders and 4 feet wide paved inside shoulders. The paved shoulders consisted of 4 inches of asphaltic concrete underlain by 6 inches of crushed aggregate base.

Another set of as-built drawings dated April 4, 2005 was obtained from GODT for the I-575 auxiliary lanes between SR 92 and Towne Lake Parkway in Cherokee County. The typical pavement section shown on these drawings consists of an open-graded friction course (OGFC) underlain by 13.5 inches of asphaltic concrete over 14 inches of graded aggregate base (GAB).

No pavement overlay, resurfacing, or other maintenance records were found during our historical data search. However, based on the thicknesses and composition (visual) of the pavement cores obtained during this study, it appears that the present study portion of I-575 has been overlaid since the initial design year of 1980/1981. It should also be noted that according to GDOT standard maintenance practice, asphalt pavements are overlaid approximately every 10 years.

**3. Traffic Data**

The traffic data used in this study is based upon data projected from the Draft Environmental Impact Statement (DEIS). It is our understanding that this data has not yet been approved by GDOT. The following traffic data was used for the pavement design:

| | |
|---|---|
| Design period | 2015 to 2035 |
| One-way AADT for initial year of design period | 44,502 vpd |
| One-way AADT for final year of design period | 51,152 vpd |
| Lane Distribution Factor | 0.8 |
| 24-hour Truck Percentage | 13.7 |

**4. Concept Report**

The concept report for this project has not yet been approved by GDOT.

**5. COPACES**

Computerized Pavement Condition Evaluation System (COPACES) was not used in this evaluation.

**6. Field Photographs**

Photographs were taken at the time of our fieldwork to record the existing pavement conditions. These photographs are included in Appendix I.

**7. Drainage Survey**

The present study section of I-575 has paved shoulders and drainage ditches on both sides, and a lowered grassed median. Based on our field reconnaissance, the roadway is in good drainage condition. No standing water or other drainage problems were observed during this survey.

**8. Non-destructive Field Testing**

No non-destructive tests were performed as part of this study.

**9. Load Cracking**

For the purpose of conducting the pavement condition survey, the project length was divided into twenty-two rating segments – eleven segments for northbound lanes and eleven segments for southbound lanes.

Level 1 load cracking ranging from 5 to 70 percent was observed. Level 2, 3 or 4 load cracking was not observed in any of the rating segments. The load cracking information is summarized in Table 1A.

**10. Block/ Transverse Cracking**

No block/transverse cracking was observed in seven of the twenty-two rating segments. Level 1 block/transverse cracking ranging from 5 to 80 percent was observed in the remaining fifteen rating segments. Level 2 or 3 block/transverse cracking was not observed in any of the rating segments. The block/transverse cracking information is summarized in Table 1A.

**11. Reflection Cracking**

No reflection cracking was observed.

**12. Raveling**

No raveling was observed in two of the twenty-two rating segments. Level 1 raveling ranging from 5 to 80 percent was observed in the remaining twenty rating segments. Approximately 5 percent Level 2 and/or 3 raveling was observed in nine rating segments. The raveling information is summarized in Table 1B.

**13. Edge Distress**

No edge distress was observed.

**14. Bleeding or Flushing**

No bleeding or flushing was observed.

**15. Corrugation or Pushing**

No corrugation or pushing was observed.

**16. Loss of Section**

No loss of section was observed.

**17. Patches and Potholes**

Patches and/or potholes were observed in fifteen of the twenty-two rating segments. The numbers of patches and/or potholes in various segments are summarized in Table 1B.

**18. Rutting**

Rut depths were measured at various locations along the present study section of I-575 and the depths ranged from 0 to ¼ inch, but were typically about 1/8 inch. The rut depths are summarized in Table 2.

**19. Cores**

Sixty-nine locations were cored on the existing pavement, of which forty-nine were located on the main line and twenty on the exit/entrance ramps. The core information is summarized in Table 2, and core sample photographs are included in Appendix II.

As shown in Table 2, the existing pavement consists of asphaltic concrete underlain by GAB. The thickness of asphaltic concrete and GAB vary along the project alignment. Between Barrett Parkway and SR 92, the thickness of asphaltic concrete and GAB range from 16 to 22 inches and 6 to 15 inches, respectively, but typically from 17 to 20.5 inches and 11 to 13 inches, respectively. The average thicknesses of asphaltic concrete and GAB in this segment are 18.8 inches and 12.1 inches, respectively. Between SR 92 and Sixes Road, the thickness of asphaltic concrete and GAB range from 13.5 to 18 inches and 8 to 14 inches, respectively, but typically from 13.5 to 15.5 inches and 9 to 11 inches, respectively. The average thicknesses of asphaltic concrete and GAB in this segment are 14.9 inches and 10.5 inches, respectively.

Crack depths were measured at the core locations in cracked areas and are summarized in Table 2. As shown in Table 2, the depth of cracks at these locations ranged from 1.5 to 8.25 inches. Excluding two locations where crack depths are excessive, the average crack depth is about 2.5 inches with a standard deviation of about 0.7 inch.

**20. Laboratory Testing**

I. Pavement Composition Tests

Twenty sets of laboratory composition tests were performed on various layers of representative asphalt pavement cores. These tests included bulk specific gravity (GDT-39), theoretical maximum specific gravity (AASHTO T-209), asphalt content (GDT-83) and gradation of extracted aggregates (GDT-38). These laboratory test results are summarized in Table 3A.

The test results indicate air voids ranging from 3.1 to 8.7% (excluding five data points that are outside the expected range) with an average of 4.8%, and asphalt contents ranging from 3.9 to 6.2% with an average of 4.8%. According to the 1993 edition of GDOT Standard Specification, the mix design requirements for air voids and asphalt contents range from 4 to 5% and 4.75 to 7.5%, respectively. The gradations of aggregates extracted from asphalt base layer cores indicate general compliance with GDOT gradation requirements for base asphaltic concrete mix with some minor variations in particles passing #8, #50 and #200 sieves. The gradations of other asphalt layers could not be compared with GDOT gradation requirements since no information is available on the overlay history. In general, the test results indicate that the asphalt pavement was likely compacted to GDOT requirements, and the asphalt contents as well as aggregate gradations generally comply with the GDOT requirements.

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**20. Laboratory Testing (continued)**

II. Rutting Susceptibility Tests

Rutting susceptibility tests were performed on twelve pavement cores obtained from the outer lanes. These tests were performed by the GDOT pavement laboratory in accordance with GDOT test method GDT 115 using an Asphalt Pavement Analyzer (APA).

The APA tests are generally performed to evaluate asphaltic concrete mix designs. The test is performed at either 120°F or 147°F under dry conditions. A maximum rut depth of 5 to 8 mm obtained from the APA tests is considered acceptable depending on the mix type.

Upon consultation with the GDOT Office of Materials and Research (OMR), the APA tests for this project were performed at 147°F under water to simulate an extreme weather condition. Results of the APA tests are presented in Table 3B. As shown in Table 3B, the measured rut depths ranged from 1.4 to 8.4 mm. Based on our discussion with the GDOT OMR, the measured rut depths indicate the rutting susceptibility of the existing pavement to be within acceptable range and the new pavement may be designed with an overlay.

**21. Pavement Condition Summary**

Based on the pavement condition survey data presented in Items 9 through 18 above, the existing pavement was rated in accordance with the Pavement Condition Evaluation System (PACES) as outlined in the 2006 GDOT Pavement Design Manual. The PACES rating values ranged from 55 to 88, but typically between 60 and 80. The PACES rating values for each rating segment are summarized in Table 4.

Based on the PACES rating values, laboratory test results and inspection of the pavement cores, the existing pavement is in fair to good condition.

**22. Special Conditions**

We understand that GDOT is considering resurfacing some portions of the present study section of I-575 to remedy the existing raveling conditions (see Item No. 12). Based on our discussion with GDOT-OMR, the resurfacing will likely involve milling and inlay, and will occur prior to the anticipated beginning of the proposed widening and reconstruction by GTP. Prior to construction work by GTP, GDOT should be contacted to obtain information about this resurfacing, and the overlay design should be revised if warranted.

**23. Flexible Pavement Design**

Flexible pavement designs are provided herein as full-depth designs for new pavements and overlay designs for the existing outer lanes of I-575.

I. Full-depth Design

A summary of the recommended full-depth sections for new pavement is presented in the following tables. These designs are based on traffic data projected from DEIS, and the GDOT pavement design guidance documents. The GDOT Asphalt Pavement Design (APD) computer program was used for these designs and a design summary output from this program is included in Appendix III. It is noted that the pavement is under-designed by about 9 to 10 percent in accordance with the guidance in GDOT Pavement Design Manual and our discussion with GDOT-OMR. The under-design accounts for the fact that the pavement is designed for a 20-year period, and GDOT typically resurfaces pavements every ten years. The two resurfacing in 20 years will usually bring up the roadway structural number to the required design value.

**Segment from Barrett Parkway to SR 92 (Cobb County)**

| Course | Material | Thickness (inches) |
|---|---|---|
| Surface | 12.5 mm PEM | 1.25 |
| Surface | 12.5 mm SMA | 2 |
| Intermediate | 19 mm Superpave | 2 |
| Asphalt Base | 25 mm Superpave | 12 |
| Base | Graded Aggregate Base | 12 |

**Segment from SR 92 to Sixes Road (Cherokee County)**

| Course | Material | Thickness (inches) |
|---|---|---|
| Surface | 12.5 mm PEM | 1.25 |
| Surface | 12.5 mm SMA | 2 |
| Intermediate | 19 mm Superpave | 2 |
| Asphalt Base | 25 mm Superpave | 11 |
| Base | Graded Aggregate Base | 12 |

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**23. Flexible Pavement Design (continued)**

II. Overlay Design

Based on our evaluation of the existing pavement surface conditions, the pavement core and subgrade data, as well as the laboratory test results, the outer lane of the existing pavement may be overlaid for the proposed construction.

The existing pavement should be milled prior to overlay construction. Based on the existing pavement surface conditions and crack depths, we recommend a milling depth of 3.5 inches (mean plus one standard deviation of crack depths = 3.2 inches) for the entire project.

A summary of the recommended overlay sections for this project is presented in the following tables. These designs are based on traffic data provided to us by GTP, the average existing pavement and subgrade conditions and the GDOT pavement design guidance documents. The GDOT Asphalt Pavement Design (APD) computer program was used for these designs and a design summary output from this program is included in Appendix III.

**Segment from Barrett Parkway to SR 92 (Cobb County)**

| Course | Material | Thickness (inches) |
|---|---|---|
| Surface | 12.5 mm PEM | 1.25 |
| Surface | 12.5 mm SMA | 2 |

**Segment from SR 92 to Sixes Road (Cherokee County)**

| Course | Material | Thickness (inches) |
|---|---|---|
| Surface | 12.5 mm PEM | 1.25 |
| Surface | 12.5 mm SMA | 2 |
| Intermediate | 19 mm Superpave | 3 |

It should be noted that the overall final grading plan for the project may require adjustment of the above recommended milling depth and overlay thickness.

**24. Rigid Pavement Design**

A summary of the recommended full-depth section of continuously reinforced concrete pavement (CRCP) for the entire project is presented in the following table. This design is based on the traffic data projected from DEIS, the 2006 GDOT Pavement Design Manual, and our discussion with GDOT-OMR. It is noted that this design conforms to GDOT's standard rigid pavement section (i.e., 12 inches on concrete underlain by 3 inches of asphalt interlayer over 12 inches of GAB) for interstate highways. The pavement is under-designed by 15 to 16 percent. The pavement section and the percent under-design were discussed with GDOT-OMR and we were advised that this design is in conformance with GDOT's standard practice for rigid pavement design. The rigid pavement design calculations are included in Appendix III.

| Course | Material | Thickness (inches) |
|---|---|---|
| Slab | Continuously Reinforced Concrete Pavement | 12 |
| Asphaltic Concrete Interlayer | 19 mm Superpave | 3 |
| Base | Graded Aggregate Base | 12 |

**25. Life Cycle Cost Analysis**

Life-Cycle Cost Analysis (LCCA) was performed in general accordance with the guidelines in the GDOT Pavement Design Manual and the Federal Highway Administration (FHWA) Interim Technical Bulletin titled *Life-Cycle Cost Analysis in Pavement Design – In Search of Better Investment Decisions*, dated September 1998. The FHWA's life-cycle cost analysis software RealCost-Version 2.2 was used to perform the LCCA. The input data and results of the LCCA are presented in Appendix IV. The results of LCCA indicate that the Net Present Value (NPV) of both agency costs and user costs are less for the designed rigid pavement (CRCP) than flexible pavement (asphaltic concrete). Based on these results, CRCP is a more economical pavement option than asphaltic concrete pavement for this project.

**Reported By:** **Paul Zhang, PE/ Sujit K. Bhowmik, PhD, PE**

**Reviewed By:** **James L. Willmer, PE**

**Table 1A**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Sample Sections | Load Cracking (%) | | | | Block/Transverse Cracking (%) | | | Reflection Cracking |
|---|---|---|---|---|---|---|---|---|---|
| | | Level 1 | Level 2 | Level 3 | Level 4 | Level 1 | Level 2 | Level 3 | |
| North Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 112+00± to 113+00± Outer Lane | 35 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| North Bound 137+05± to 188+23± (MP 2 to MP 3) | 140+50± to 141+50± Outer Lane | 20 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| North Bound 188+23± to 243+00± (MP 3 to MP 4) | 224+00± to 225+00± Outer Lane | 30 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| North Bound 243+00± to 431+87± (MP 4 to MP 5) | 270+00± to 271+00± Outer Lane | 50 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| North Bound 431+87± to 479+92± (MP 5 to MP 6) | 470+00± to 471+00± Outer Lane | 55 | 0 | 0 | 0 | 30 | 0 | 0 | None |
| North Bound 479+92± to 531+10± (MP 6 to MP 7) | 529+00± to 530+00± Outer Lane | 20 | 0 | 0 | 0 | 50 | 0 | 0 | None |
| North Bound 531+10± to 585+27± (MP 7 to MP 8) | 558+00± to 559+00± Middle Lane | 30 | 0 | 0 | 0 | 10 | 0 | 0 | None |
| North Bound 585+27± to 638+62± (MP 8 to MP 9) | 604+00± to 605+00± Middle Lane | 15 | 0 | 0 | 0 | 20 | 0 | 0 | None |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 1A**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Sample Sections | Load Cracking (%) | | | | Block/Transverse Cracking (%) | | | Reflection Cracking |
|---|---|---|---|---|---|---|---|---|---|
| | | Level 1 | Level 2 | Level 3 | Level 4 | Level 1 | Level 2 | Level 3 | |
| North Bound 638+62± to 691+20± (MP 9 to MP 10) | 659+00± to 660+00± Outer Lane | 5 | 0 | 0 | 0 | 40 | 0 | 0 | None |
| North Bound 691+20± to 740+54± (MP 10 to MP 11) | 724+00± to 725+00± Outer Lane | 20 | 0 | 0 | 0 | 30 | 0 | 0 | None |
| North Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 750+00± to 751+00± Outer Lane | 20 | 0 | 0 | 0 | 15 | 0 | 0 | None |
| South Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 119+00± to 120+00± Outer Lane | 40 | 0 | 0 | 0 | 20 | 0 | 0 | None |
| South Bound 137+05± to 188+23± (MP 2 to MP 3) | 165+00± to 166+00± Outer Lane | 30 | 0 | 0 | 0 | 20 | 0 | 0 | None |
| South Bound 188+23± to 243+00± (MP 3 to MP 4) | 205+00± to 206+00± Outer Lane | 70 | 0 | 0 | 0 | 15 | 0 | 0 | None |
| South Bound 243+00± to 431+87± (MP 4 to MP 5) | 280+00± to 281+00± Outer Lane | 25 | 0 | 0 | 0 | 15 | 0 | 0 | None |
| South Bound 431+87± to 479+92± (MP 5 to MP 6) | 469+00± to 470+00± Outer Lane | 70 | 0 | 0 | 0 | 50 | 0 | 0 | None |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 1A**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Sample Sections | Load Cracking (%) | | | | Block/Transverse Cracking (%) | | | Reflection Cracking |
|---|---|---|---|---|---|---|---|---|---|
| | | Level 1 | Level 2 | Level 3 | Level 4 | Level 1 | Level 2 | Level 3 | |
| South Bound 479+92± to 531+10± (MP 6 to MP 7) | 485+00± to 486+00± Inner Lane | 55 | 0 | 0 | 0 | 80 | 0 | 0 | None |
| South Bound 531+10± to 585+27± (MP 7 to MP 8) | 550+00± to 551+00± Middle Lane | 5 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| South Bound 585+27± to 638+62± (MP 8 to MP 9) | 629+00± to 630+00± Outer Lane | 10 | 0 | 0 | 0 | 5 | 0 | 0 | None |
| South Bound 638+62± to 691+20± (MP 9 to MP 10) | 642+00± to 643+00± Outer Lane | 50 | 0 | 0 | 0 | 10 | 0 | 0 | None |
| South Bound 691+20± to 740+54± (MP 10 to MP 11) | 697+00± to 698+00± Outer Lane | 20 | 0 | 0 | 0 | 0 | 0 | 0 | None |
| South Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 754+00± to 755+00± Inner Lane | 20 | 0 | 0 | 0 | 0 | 0 | 0 | None |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 1B**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Raveling (%) | | | Edge Distress | Bleeding & Flushing | Corrugation & Pushing | Loss of Section | Patches & Potholes |
|---|---|---|---|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | | | | | |
| North Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 60 | 0 | 0 | None | None | None | None | 0 |
| North Bound 137+05± to 188+23± (MP 2 to MP 3) | 60 | 0 | 0 | None | None | None | None | 0 |
| North Bound 188+23± to 243+00± (MP 3 to MP 4) | 80 | 0 | 0 | None | None | None | None | 0 |
| North Bound 243+00± to 431+87± (MP 4 to MP 5) | 70 | 5 | 5 | None | None | None | None | 3 |
| North Bound 431+87± to 479+92± (MP 5 to MP 6) | 20 | 0 | 0 | None | None | None | None | 2 |
| North Bound 479+92± to 531+10± (MP 6 to MP 7) | 10 | 0 | 0 | None | None | None | None | 2 |
| North Bound 531+10± to 585+27± (MP 7 to MP 8) | 20 | 0 | 5 | None | None | None | None | 3 |
| North Bound 585+27± to 638+62± (MP 8 to MP 9) | 5 | 0 | 5 | None | None | None | None | 2 |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 1B**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Raveling (%) | | | Edge Distress | Bleeding & Flushing | Corrugation & Pushing | Loss of Section | Patches & Potholes |
|---|---|---|---|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | | | | | |
| North Bound 638+62± to 691+20± (MP 9 to MP 10) | 80 | 0 | 0 | None | None | None | None | 3 |
| North Bound 691+20± to 740+54± (MP 10 to MP 11) | 40 | 0 | 0 | None | None | None | None | 3 |
| North Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 0 | 0 | 0 | None | None | None | None | 2 |
| South Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 60 | 5 | 0 | None | None | None | None | 0 |
| South Bound 137+05± to 188+23± (MP 2 to MP 3) | 60 | 5 | 0 | None | None | None | None | 0 |
| South Bound 188+23± to 243+00± (MP 3 to MP 4) | 10 | 5 | 0 | None | None | None | None | 3 |
| South Bound 243+00± to 431+87± (MP 4 to MP 5) | 10 | 0 | 0 | None | None | None | None | 2 |
| South Bound 431+87± to 479+92± (MP 5 to MP 6) | 5 | 0 | 0 | None | None | None | None | 0 |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 1B**
**Summary of Pavement Conditions**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | Raveling (%) | | | Edge Distress | Bleeding & Flushing | Corrugation & Pushing | Loss of Section | Patches & Potholes |
|---|---|---|---|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | | | | | |
| South Bound 479+92± to 531+10± (MP 6 to MP 7) | 10 | 0 | 0 | None | None | None | None | 4 |
| South Bound 531+10± to 585+27± (MP 7 to MP 8) | 50 | 0 | 5 | None | None | None | None | 0 |
| South Bound 585+27± to 638+62± (MP 8 to MP 9) | 5 | 0 | 0 | None | None | None | None | 5 |
| South Bound 638+62± to 691+20± (MP 9 to MP 10) | 5 | 0 | 5 | None | None | None | None | 2 |
| South Bound 691+20± to 740+54± (MP 10 to MP 11) | 50 | 5 | 5 | None | None | None | None | 2 |
| South Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 0 | 0 | 0 | None | None | None | None | 1 |

Notes:
1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| NB-1 | North Bound 112+35, Outer Lane | 19 | 11 ½ | 1/8 | None |
| NB-2 | North Bound 130+00, Inner Lane | 18 ½ | 12 | 1/8 | 2 ¼ |
| NB-3 | North Bound 140+50, Outer Lane | 20 ½ | 12 ½ | 1/8 | 2 ¾ |
| NB-4 | North Bound 175+00, Inner Lane | 19 ¼ | 12 | 1/8 | None |
| NB-5 | North Bound 202+00, Inner Lane | 17 ¼ | 11 ½ | 1/8 | None |
| NB-6 | North Bound 220+00, Outer Lane | 17 ½ | 12 | 1/8 | None |
| NB-7 | North Bound 245+00, Inner Lane | 20 ½ | 14 | 1/8 | 2 |
| NB-8 | North Bound 270+50, Outer Lane | 20 ½ | 11 ½ | 1/4 | 2 |
| NB-9 | North Bound 444+00, Inner Lane | 18 ½ | 11 | 1/8 | None |
| NB-10 | North Bound 471+00, Outer Lane | 17 | 15 | 1/8 | 4 |
| NB-11 | North Bound 498+00, Inner Lane | 19 | 11 | 1/8 | 2 ¼ |
| NB-12 | North Bound 529+50, Outer Lane | 15 | 11 | 1/8 | None |
| NB-13 | North Bound 553+00, Outer Lane | 14 | 14 | 0 | None |
| NB-13A | North Bound 558+00, Middle Lane | 15 ½ | 12 ½ | 0 | 1 ¾ |

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| NB-14 | North Bound 576+00, Inner Lane | 15 ¼ | 13 | 1/8 | None |
| NB-15 | North Bound 605+00, Middle Lane | 15 | 10 ½ | 1/8 | None |
| NB-15A | North Bound 619+50, Outer Lane | 14 | 12 | 0 | 3 |
| NB-16 | North Bound 631+00, Inner Lane | 15 ¼ | 10 ½ | 1/8 | None |
| NB-17 | North Bound 660+00, Outer Lane | 15 | 10 | 1/8 | None |
| NB-18 | North Bound 685+00, Inner Lane | 15 | 10 | 1/8 | None |
| NB-19 | North Bound 699+00, Inner Lane | 15 ¼ | 9 ¾ | 0 | None |
| NB-20 | North Bound 720+00, Outer Lane | 14 | 10 | 1/8 | None |
| NB-21 | North Bound 750+00, Outer Lane | 15 | 9 ½ | 1/8 | None |
| NB-22 | North Bound 755+00, Inner Lane | 16 | 9 ½ | 0 | None |
| SB-1 | South Bound 110+00, Inner Lane | 17 ¼ | 11 ¾ | 1/8 | 3 |
| SB-2 | South Bound 119+00, Outer Lane | 18 | 6 | 1/8 | None |
| SB-3 | South Bound 166+00, Inner Lane | 19 | 12 | 0 | 8 ¼ |
| SB-4 | South Bound 165+50, Outer Lane | 19 | 12 ½ | 1/8 | None |

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| SB-4A | South Bound 195+00, Middle Lane | 19 ¾ | 12 ¼ | 1/8 | None |
| SB-5 | South Bound 206+00, Outer Lane | 20 ½ | 13 | 0 | None |
| SB-6 | South Bound 230+00, Inner Lane | 22 | 12 | 0 | None |
| SB-7 | South Bound 267+50, Inner Lane | 18 | 14 ½ | 0 | 3 ¼ |
| SB-8 | South Bound 281+00, Outer Lane | 18 ½ | 12 ½ | 1/8 | None |
| SB-9 | South Bound 435+00, Inner Lane | 19 | 12 | 1/8 | None |
| SB-10 | South Bound 469+00, Outer Lane | 17 ½ | 14 | 1/8 | 3 ½ |
| SB-11 | South Bound 486+00, Inner Lane | 18 ¼ | 12 | 1/8 | 2 |
| SB-12 | South Bound 520+00, Outer Lane | 16 | 12 | 1/8 | None |
| SB-13 | South Bound 551+00, Middle Lane | 15 | 10 ½ | 1/8 | None |
| SB-13A | South Bound 550+00, Outer Lane | 13 ½ | 13 | 0 | None |
| SB-14 | South Bound 581+00, Inner Lane | 18 | 10 | 1/8 | None |
| SB-15 | South Bound 609+50, Outer Lane | 14 ¼ | 10 ¼ | 1/8 | None |
| SB-16 | South Bound 626+00, Inner Lane | 15 ½ | 9 ½ | 0 | None |

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| SB-17 | South Bound 642+50, Outer Lane | 13 ½ | 10 | 1/8 | 5 ½ |
| SB-18 | South Bound 671+00, Inner Lane | 15 | 9 | 0 | None |
| SB-18A | South Bound 655+50, Outer Lane | 14 | 8 | 0 | 2 ½ |
| SB-19 | South Bound 700+00, Outer Lane | 14 ¾ | 9 ½ | 1/8 | None |
| SB-20 | South Bound 730+00, Inner Lane | 15 ½ | 9 ½ | 0 | None |
| SB-21 | South Bound 750+70, Outer Lane | 14 | 10 | 1/8 | 2 |
| SB-22 | South Bound 755+00, Inner Lane | 15 | 10 | 1/8 | 1 ½ |
| NB-R1 | 31+50, Barrett Pkwy NB Entrance Ramp 5' from right edge | 5 ½ | 16 | 0 | None |
| NB-R2 | 37+50, Chastain Rd NB Exit Ramp 8' from right edge | 15 ½ | 11 | 0 | None |
| NB-R3 | 26+50, Chastain Rd NB Entrance Ramp 9' from right edge | 19 ¼ | 10 | 0 | None |
| NB-R4 | 42+00, Bells Ferry Rd NB Exit Ramp 8' from right edge | 12 ¼ | 11 | 0 | None |

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| NB-R5 | 27+00, Bells Ferry Rd<br>NB Entrance Ramp<br>6' from left edge | 15 | 8 | 0 | None |
| NB-R6 | 39+50, SR 92<br>NB Exit Ramp<br>7' from left edge | 16 | 14 | 0 | None |
| NB-R7 | 33+00, SR 92<br>NB Entrance Ramp<br>8' from right edge | 11 ½ | 12 ½ | 0 | None |
| NB-R8 | 37+50, Towne Lake Pkwy<br>NB Exit Ramp<br>7' from left edge | 8 ¾ | 7 | 0 | None |
| NB-R9 | 27+00, Towne Lake Pkwy<br>NB Entrance Ramp<br>5' from left edge | 8 | 10 | 0 | None |
| NB-R10 | 37+00, Sixes Rd<br>NB Exit Ramp<br>8' from left edge | 9 | 11 | 0 | None |
| SB-R1 | 21+50, Barrett Pkwy<br>SB Exit Ramp<br>6' from left edge | 8 | 10 | 0 | None |
| SB-R2 | 17+00, Chastain Rd<br>SB Entrance Ramp<br>7' from right edge | 14 | 11 | 0 | None |

**Table 2**
**Summary of Pavement Core, Rut Depth and Crack Depth Information**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Asphalt Pavement Thickness (inches) | Graded Aggregate Base Thickness (inches) | Rut Depth (inches) | Crack Depth (inches) |
|---|---|---|---|---|---|
| SB-R3 | 11+50, Chastain Rd SB Exit Ramp 5' from left edge | 11 | 11 ½ | 0 | None |
| SB-R4 | 23+00, Bells Ferry Rd SB Entrance Ramp 5' from right edge | 4 ¼ | 18 | 0 | None |
| SB-R5 | 11+50, Bells Ferry Rd SB Exit Ramp 5' from left edge | 13 ¼ | 6 ½ | 0 | None |
| SB-R6 | 16+00, SR 92 SB Entrance Ramp 7' from right edge | 10 | 12 | 0 | None |
| SB-R7 | 12+50, SR 92 SB Exit Ramp 6' from left edge | 12 ¼ | 13 ½ | 0 | None |
| SB-R8 | 17+00, Towne Lake Pkwy SB Entrance Ramp 7' from left edge | 9 ½ | 11 | 0 | None |
| SB-R9 | 10+50, Towne Lake Pkwy SB Exit Ramp 6' from left edge | 9 ½ | 11 | 0 | None |
| SB-R10 | 20+00, Sixes Rd SB Entrance Ramp 9' from left edge | 9 | 8 | 0 | None |

**Table 3A**
**Summary of Laboratory Test Results**
**Pavement Composition Tests**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Layer (inches) | BSG | TMSG | Air Voids (%) | AC (%) | Percent Aggregates Passing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.5" | 1" | 3/4" | 1/2" | 3/8" | #4 | #8 | #16 | #30 | #50 | #100 | #200 |
| NB-3 | North Bound 140+50 Outer Lane | ½ - 2 ½ | 2.35 | 2.58 | 8.7 | 4.0 | 100 | 100 | 100 | 95.5 | 84.5 | 57.9 | 42.3 | 34.2 | 28.4 | 22.1 | 15.3 | 7.9 |
| | | 2 ½ - 5 ½ | 2.39 | 2.52 | 5.2 | 6.1 | 100 | 100 | 100 | 100 | 99.0 | 71.0 | 51.5 | 42.9 | 35.3 | 26.4 | 18.1 | 11.2 |
| | | 5 ½ - 8 ½ | 2.47 | 2.57 | 3.7 | 4.9 | 100 | 100 | 97.5 | 87.9 | 77.5 | 57.1 | 45.6 | 38.8 | 32.0 | 23.6 | 15.9 | 9.4 |
| | | 8 ½ - 20 ½ | 2.47 | 2.59 | 4.7 | 3.9 | 100 | 92.6 | 77.0 | 66.7 | 62.3 | 48.5 | 39.6 | 34.0 | 28.4 | 21.1 | 14.2 | 8.6 |
| NB-9 | North Bound 444+00 Inner Lane | ½ - 3 | 2.43 | 2.56 | 5.2 | 4.5 | 100 | 100 | 100 | 97.1 | 86.6 | 61.5 | 48.3 | 39.2 | 31.9 | 23.7 | 15.6 | 8.3 |
| | | 3 - 5 | 2.46 | 2.53 | 3.1 | 3.9 | 100 | 100 | 100 | 93.3 | 78.9 | 57.8 | 44.6 | 36.8 | 30.5 | 23.3 | 16.5 | 10.8 |
| | | 5 - 18 ½ | 2.52 | 2.55 | 1.4 | 4.7 | 100 | 95.9 | 88.2 | 77.3 | 70.8 | 54.6 | 45.5 | 39.5 | 33.0 | 24.5 | 16.8 | 10.7 |
| NB-14 | North Bound 576+00 Inner Lane | 2 ¾ - 4 ¼ | 2.43 | 2.53 | 3.7 | 5.7 | 100 | 100 | 100 | 100 | 97.7 | 75.2 | 50.3 | 38.5 | 29.8 | 20.4 | 12.9 | 7.6 |
| | | 5 ¾ - 15 ¼ | 2.51 | 2.58 | 2.7 | 4.4 | 100 | 97.4 | 84.4 | 68.2 | 59.0 | 43.7 | 37.4 | 32.1 | 26.2 | 18.4 | 11.8 | 7.0 |
| NB-20 | North Bound 720+00 Outer Lane | ½ - 2 | 2.45 | 2.58 | 4.9 | 4.3 | 100 | 98.5 | 97.4 | 94.9 | 86.0 | 62.5 | 45.9 | 36.6 | 29.6 | 21.7 | 14.2 | 8.0 |
| | | 3 - 5 | 2.53 | 2.55 | 0.9 | 5.1 | 100 | 100 | 98.5 | 79.4 | 66.4 | 50.6 | 39.7 | 32.7 | 26.6 | 19.3 | 12.6 | 7.3 |

Notes:

1. BSG - Bulk Specific Gravity, as obtained by Georgia DOT test method GDT-39.
2. TMSG - Theoretical Maximum Specific Gravity, as obtained by AASHTO test method T-209
3. AC - Asphalt Content, as obtained by Georgia DOT test method GDT-83
4. The gradation of extracted aggregates from asphalt pavement core was obtained by Georgia DOT test method GDT-38
5. The shaded data are outside expected range and were excluded from our evaluation.

**Table 3A**
**Summary of Laboratory Test Results**
**Pavement Composition Tests**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Layer (inches) | BSG | TMSG | Air Voids (%) | AC (%) | Percent Aggregates Passing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.5" | 1" | 3/4" | 1/2" | 3/8" | #4 | #8 | #16 | #30 | #50 | #100 | #200 |
| SB-8 | South Bound 281+00 Outer Lane | 1 ½ - 3 | 2.45 | 2.57 | 5.0 | 4.7 | 100 | 100 | 100 | 96.4 | 83.2 | 60.7 | 46.5 | 38.1 | 31.4 | 23.9 | 16.2 | 9.3 |
| | | 3 - 5 ½ | 2.49 | 2.58 | 3.5 | 4.5 | 100 | 100 | 99.7 | 89.4 | 79.3 | 59.1 | 47.4 | 40.4 | 33.9 | 25.5 | 17.3 | 10.5 |
| SB-11 | South Bound 486+00 Inner Lane | 1 ¼ - 2 ¾ | 2.43 | 2.59 | 6.2 | 4.4 | 100 | 100 | 100 | 95.0 | 83.1 | 57.1 | 41.8 | 33.0 | 27.1 | 21.0 | 14.7 | 8.4 |
| | | 2 ¾ - 5 ¼ | 2.46 | 2.56 | 3.9 | 5.0 | 100 | 100 | 100 | 93.4 | 80.2 | 54.6 | 41.9 | 34.9 | 29.0 | 22.0 | 15.2 | 9.3 |
| | | 5 ¼ - 18 ¼ | 2.45 | 2.57 | 4.6 | 4.4 | 100 | 96.8 | 84.8 | 71.3 | 62.3 | 48.1 | 40.3 | 35.3 | 29.5 | 22.0 | 14.8 | 9.1 |
| SB-17 | South Bound 642+50 Outer Lane | ½ - 2 | 2.45 | 2.56 | 4.4 | 4.8 | 100 | 100 | 100 | 97.5 | 89.5 | 61.2 | 43.6 | 34.0 | 27.6 | 20.9 | 14.3 | 8.4 |
| | | 3 - 4 ½ | 2.49 | 2.53 | 1.3 | 5.8 | 100 | 100 | 100 | 87.7 | 73.1 | 53.7 | 43.6 | 36.9 | 30.3 | 21.9 | 14.3 | 8.7 |
| SB-20 | South Bound 730+00 Inner Lane | 2 ½ - 4 | 2.45 | 2.51 | 2.6 | 6.2 | 100 | 100 | 100 | 100 | 99.7 | 82.5 | 52.9 | 40.3 | 31.6 | 22.2 | 14.0 | 7.6 |
| | | 6 - 15 ½ | 2.46 | 2.58 | 4.7 | 4.4 | 100 | 97.8 | 86.9 | 70.9 | 62.0 | 44.9 | 36.9 | 32.0 | 27.0 | 20.2 | 13.7 | 8.4 |

Notes:

1. BSG - Bulk Specific Gravity, as obtained by Georgia DOT test method GDT-39.
2. TMSG - Theoretical Maximum Specific Gravity, as obtained by AASHTO test method T-209
3. AC - Asphalt Content, as obtained by Georgia DOT test method GDT-83
4. The gradation of extracted aggregates from asphalt pavement core was obtained by Georgia DOT test method GDT-38
5. The shaded data are outside expected range and were excluded from our evaluation.

**Table 3B**
**Summary of Laboratory Test Results**
**Rutting Susceptibility Tests**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Test Number | Rut Depth (mm) | Average Rut Depth (mm) |
|---|---|---|---|---|
| NB-1 | North Bound 112+35, Outer Lane | 1 | 4.19 | 8.41 |
| | | 2 | 4.82 | |
| | | 3 | 10.75 | |
| | | 4 | 11.98 | |
| | | 5 | 10.30 | |
| NB-8 | North Bound 270+50, Outer Lane | 1 | 8.49 | 7.62 |
| | | 2 | 8.53 | |
| | | 3 | 9.82 | |
| | | 4 | 5.69 | |
| | | 5 | 5.55 | |
| NB-12 | North Bound 529+50, Outer Lane | 1 | 4.52 | 5.40 |
| | | 2 | 7.72 | |
| | | 3 | 6.19 | |
| | | 4 | 3.20 | |
| NB-13 | North Bound 553+00, Outer Lane | 1 | 5.41 | 7.06 |
| | | 2 | 8.43 | |
| | | 3 | 7.35 | |
| NB-15A | North Bound 619+50, Outer Lane | 1 | 2.17 | 1.41 |
| | | 2 | 0.77 | |
| | | 3 | 1.28 | |
| NB-17 | North Bound 660+00, Outer Lane | 1 | 1.00 | 3.87 |
| | | 2 | 8.20 | |
| | | 3 | 2.69 | |
| | | 4 | 3.60 | |

Notes:

1. Rut depths were obtained by Georgia DOT test method GDT 115, with test temperature at 147 °F under water.

**Table 3B**
**Summary of Laboratory Test Results**
**Rutting Susceptibility Tests**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Core Number | Location | Test Number | Rut Depth (mm) | Average Rut Depth (mm) |
|---|---|---|---|---|
| SB-4 | South Bound 165+50, Outer Lane | 1 | 6.70 | 5.24 |
| | | 2 | 6.07 | |
| | | 3 | 3.52 | |
| | | 4 | 5.94 | |
| | | 5 | 3.97 | |
| SB-5 | South Bound 206+00, Outer Lane | 1 | 5.02 | 5.09 |
| | | 2 | 5.23 | |
| | | 3 | 6.19 | |
| | | 4 | 8.39 | |
| | | 5 | 4.09 | |
| | | 6 | 1.63 | |
| SB-12 | South Bound 520+00, Outer Lane | 1 | 4.55 | 4.25 |
| | | 2 | 5.92 | |
| | | 3 | 3.82 | |
| | | 4 | 2.71 | |
| SB-15 | South Bound 609+50, Outer Lane | 1 | 4.98 | 3.92 |
| | | 2 | 3.75 | |
| | | 3 | 3.60 | |
| | | 4 | 3.36 | |
| SB-18A | South Bound 655+50, Outer Lane | 1 | 8.85 | 8.12 |
| | | 2 | 5.15 | |
| | | 3 | 10.37 | |
| SB-21 | South Bound 750+70, Outer Lane | 1 | 4.85 | 1.66 |
| | | 2 | 0.04 | |
| | | 3 | 0.08 | |

Notes:

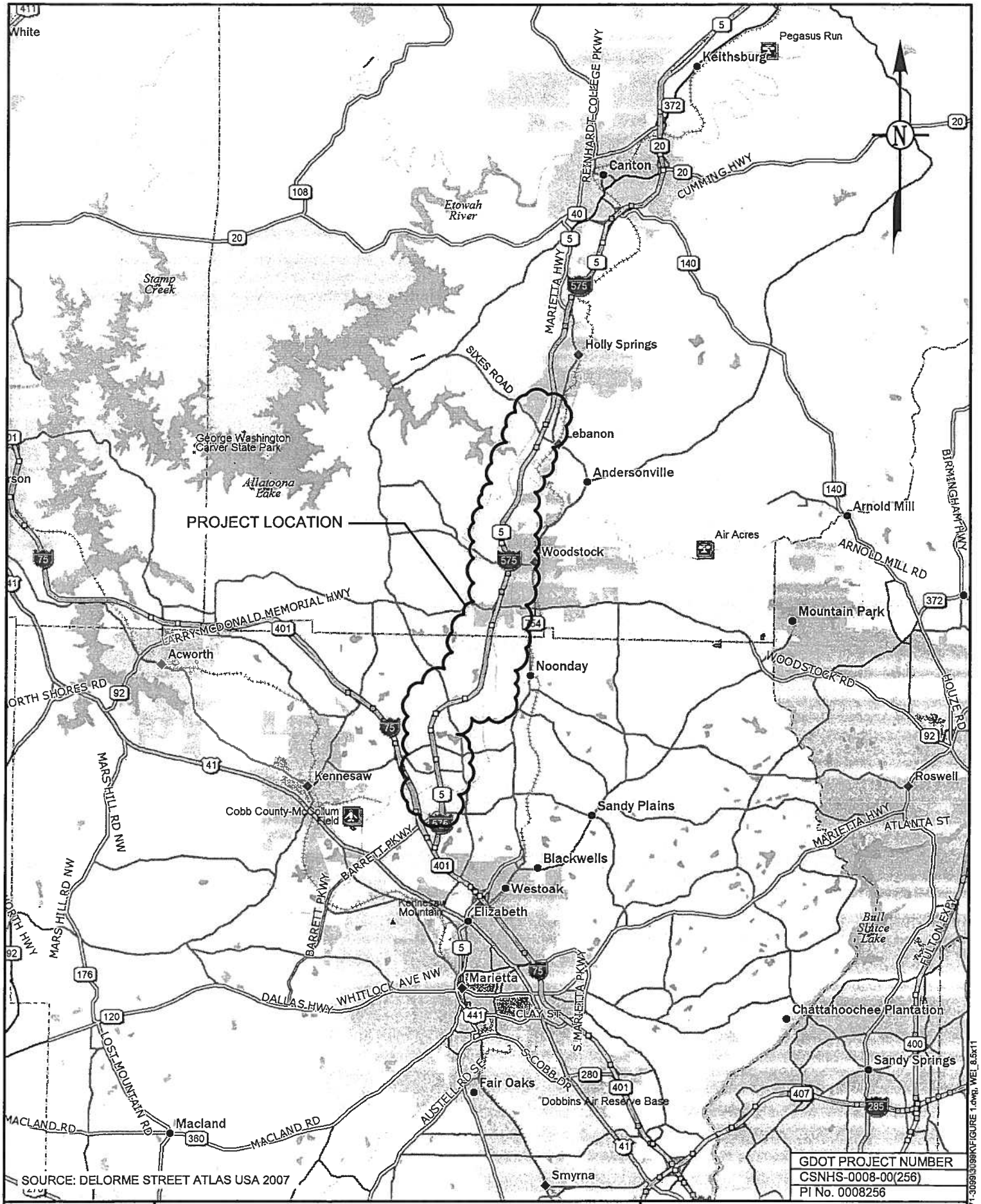
1. Rut depths were obtained by Georgia DOT test method GDT 115, with test temperature at 147 °F under water.

**Table 4**
**Summary of PACES Ratings**
**I-575 from Barrett Parkway to Sixes Road**
**Northwest Corridor Project**

| Rating Segments | PACES Rating Values | Rating Segments | PACES Rating Values |
|---|---|---|---|
| North Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 74 | South Bound 80+00± to 137+05± (MP 0.92 to MP 2) | 66 |
| North Bound 137+05± to 188+23± (MP 2 to MP 3) | 77 | South Bound 137+05± to 188+23± (MP 2 to MP 3) | 69 |
| North Bound 188+23± to 243+00± (MP 3 to MP 4) | 75 | South Bound 188+23± to 243+00± (MP 3 to MP 4) | 70 |
| North Bound 243+00± to 431+87± (MP 4 to MP 5) | 65 | South Bound 243+00± to 431+87± (MP 4 to MP 5) | 79 |
| North Bound 431+87± to 479+92± (MP 5 to MP 6) | 68 | South Bound 431+87± to 479+92± (MP 5 to MP 6) | 71 |
| North Bound 479+92± to 531+10± (MP 6 to MP 7) | 73 | South Bound 479+92± to 531+10± (MP 6 to MP 7) | 55 |
| North Bound 531+10± to 585+27± (MP 7 to MP 8) | 73 | South Bound 531+10± to 585+27± (MP 7 to MP 8) | 81 |
| North Bound 585+27± to 638+62± (MP 8 to MP 9) | 78 | South Bound 585+27± to 638+62± (MP 8 to MP 9) | 82 |
| North Bound 638+62± to 691+20± (MP 9 to MP 10) | 67 | South Bound 638+62± to 691+20± (MP 9 to MP 10) | 72 |
| North Bound 691+20± to 740+54± (MP 10 to MP 11) | 68 | South Bound 691+20± to 740+54± (MP 10 to MP 11) | 75 |
| North Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 83 | South Bound 740+54± to 759+00± (MP 11 to MP 11.35) | 88 |

Notes:

1. MP - Mile Post.
2. Station numbers at the beginning and end of rating segments are approximate.




SOURCE: DELORME STREET ATLAS USA 2007

| GDOT PROJECT NUMBER |
|---|
| CSNHS-0008-00(256) |
| PI No. 0008256 |

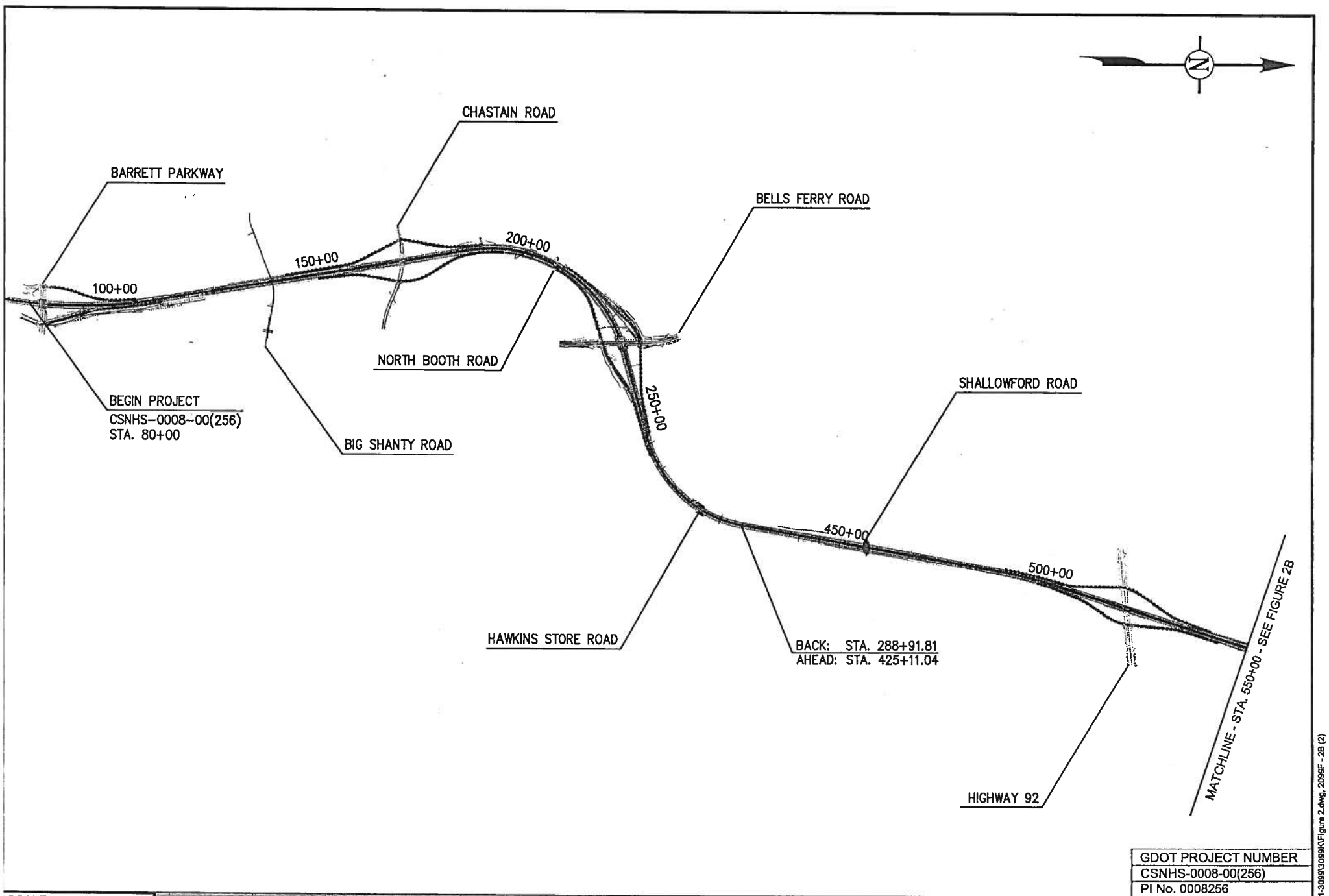
| SCALE: 1" = 3 MILES |
|---|
| |
| DATE: 1/10/2008 |
| DRAWN BY: MDB |
| REVIEWED BY: PZ |


WILLMER ENGINEERING INC. WE

GEOTECHNICAL ENGINEERING
CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270


FIGURE 1
PROJECT LOCATION MAP
I-575 FROM BARRETT PARKWAY TO SIXES ROAD
NORTHWEST CORRIDOR PROJECT
COBB AND CHEROKEE COUNTIES, GEORGIA
WILLMER PROJECT No. ATL-171-3099K

I:\Auto\CAD\171-GEO\171-3099\3099K\FIGURE 1.dwg, WEL_8.5x11




| GDOT PROJECT NUMBER |
|---|
| CSNHS-0008-00(256) |
| PI No. 0008256 |

| |
|---|
| SCALE: 1" = 3000' |
| |
| DATE: 1/11/2008 |
| DRAWN BY: MDB |
| REVIEWED BY: PZ |

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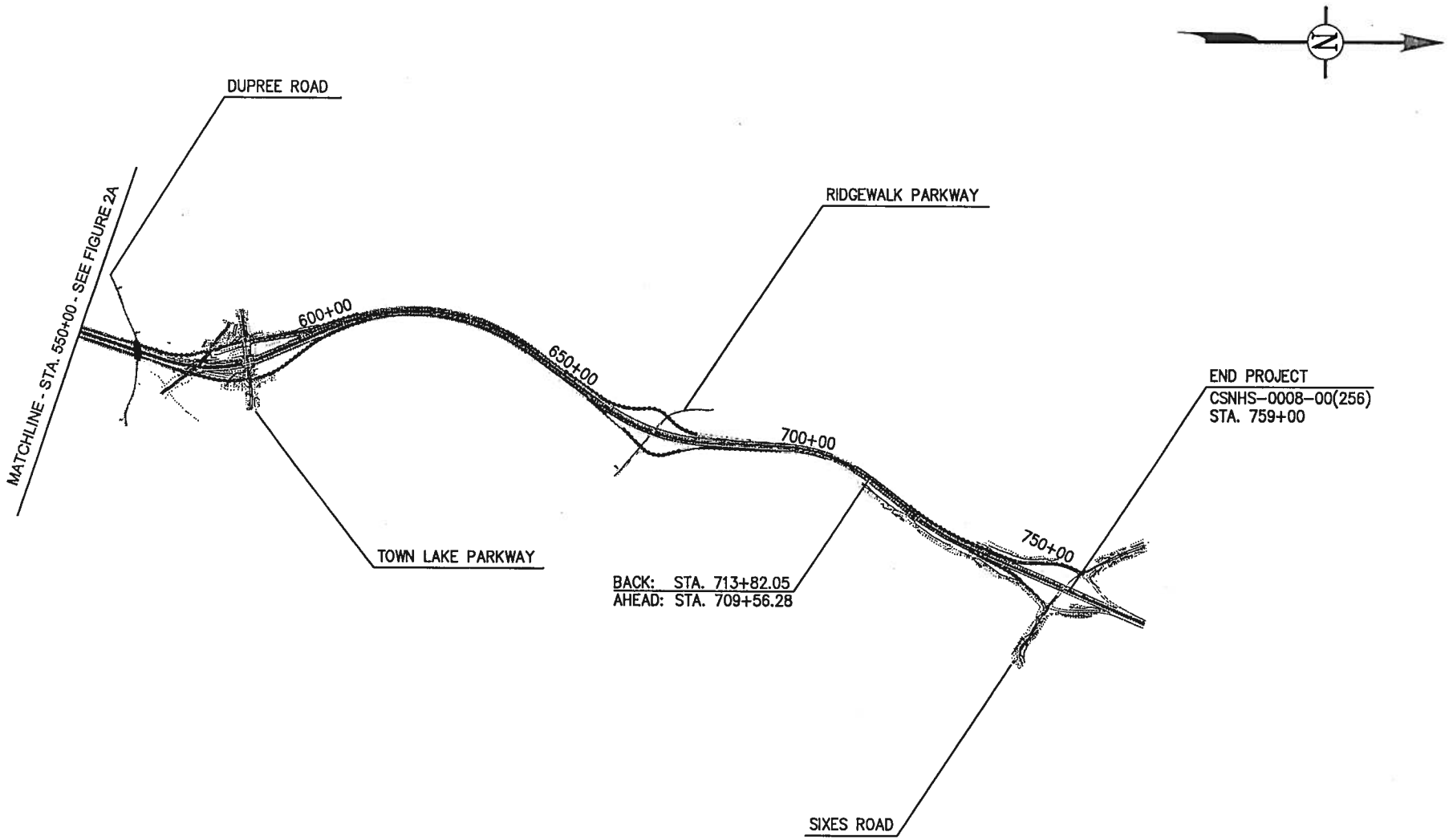
GEOTECHNICAL ENGINEERING ¤ CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 2A
PROJECT ALIGNMENT MAP
I-575 FROM BARRETT PARKWAY TO SIXES ROAD
NORTHWEST CORRIDOR PROJECT
COBB AND CHEROKEE COUNTIES, GEORGIA
WILLMER PROJECT No. ATL-171-3099K

I:\AutoCAD\171-GEO\171-3099\3099K\Figure 2.dwg, 2099F - 2B (2)




| GDOT PROJECT NUMBER |
|---|
| CSNHS-0008-00(256) |
| PI No. 0008256 |

| |
|---|
| SCALE: 1" = 3000' |
| |
| DATE: 1/11/2008 |
| DRAWN BY: MDB |
| REVIEWED BY: PZ |

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ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 2B
PROJECT ALIGNMENT MAP
I-575 FROM BARRETT PARKWAY TO SIXES ROAD
NORTHWEST CORRIDOR PROJECT
COBB AND CHEROKEE COUNTIES, GEORGIA
WILLMER PROJECT No. ATL-171-3099K

I:\AutoCAD\171-GEO\171-3099\3099K\Figure 2.dwg, 2099F - 2B (3)

Station 112+50, North Bound, Facing South; 09/28/07

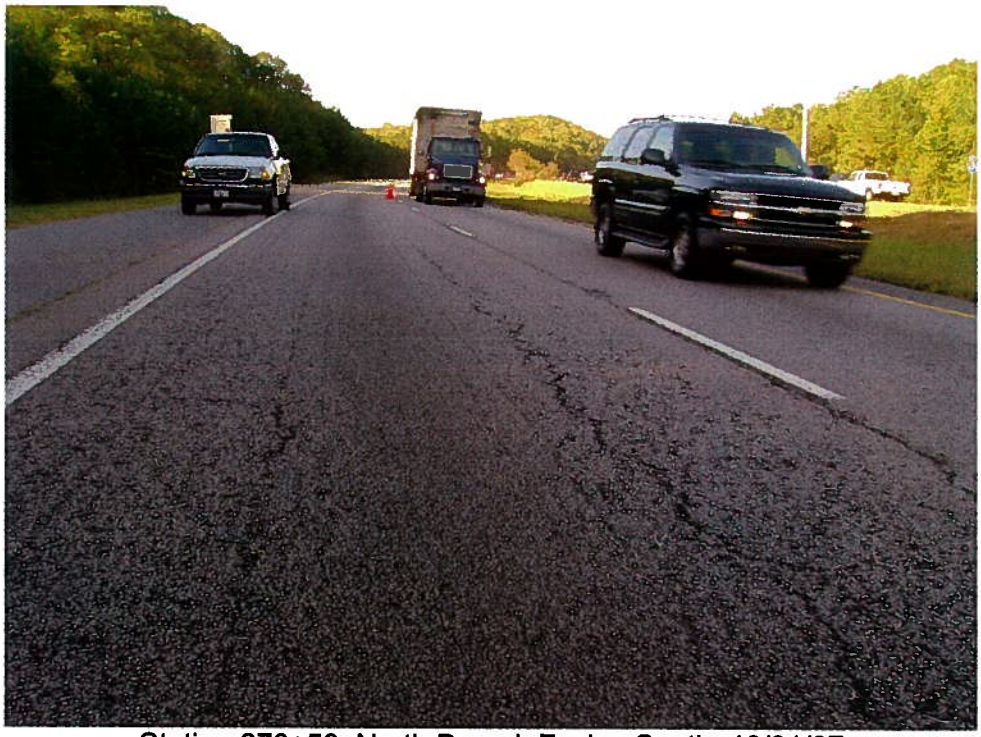
Station 112+50, North Bound, Facing North; 09/28/07

Station 141+00, North Bound, Facing South; 09/28/07

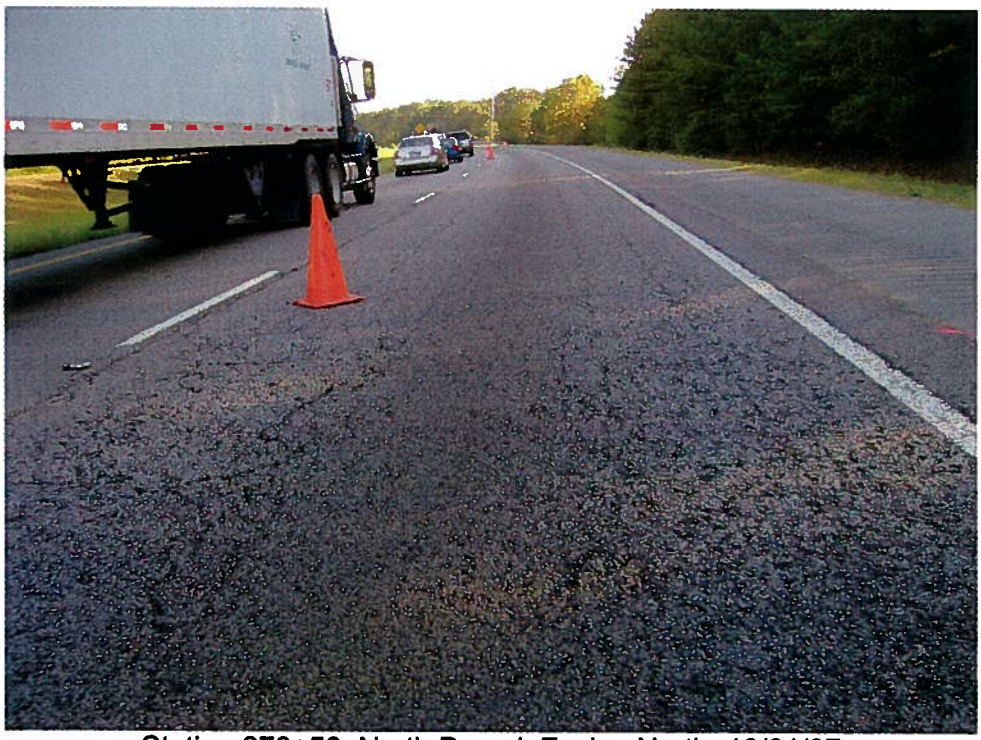
Station 141+00, North Bound, Facing North; 09/28/07

Station 224+50, North Bound, Facing South; 10/01/07

Station 224+50, North Bound, Facing North; 10/01/07



Station 270+50, North Bound, Facing South; 10/01/07



Station 270+50, North Bound, Facing North; 10/01/07

Station 470+50, North Bound, Facing South; 10/02/07

Station 470+50, North Bound, Facing North; 10/02/07

Station 529+50, North Bound, Facing South; 10/02/07

Station 529+50, North Bound, Facing North; 10/02/07

Station 558+50, North Bound, Facing South; 10/03/07

Station 558+50, North Bound, Facing North; 10/03/07

Station 604+50, North Bound, Facing South; 10/03/07

Station 604+50, North Bound, Facing North; 10/03/07

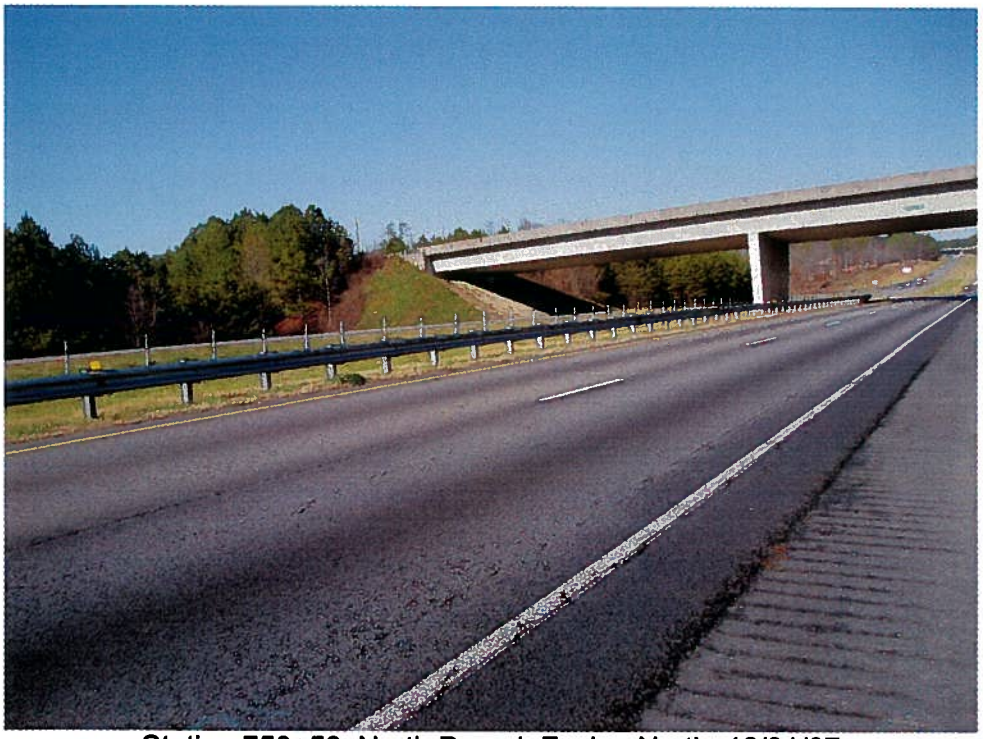
Station 659+50, North Bound, Facing South; 10/04/07

Station 659+50, North Bound, Facing North; 10/04/07

Station 724+50, North Bound, Facing South; 12/31/07

Station 724+50, North Bound, Facing North; 12/31/07

Station 750+50, North Bound, Facing South; 12/31/07



Station 750+50, North Bound, Facing North; 12/31/07

Station 119+50, South Bound, Facing North; 10/21/07

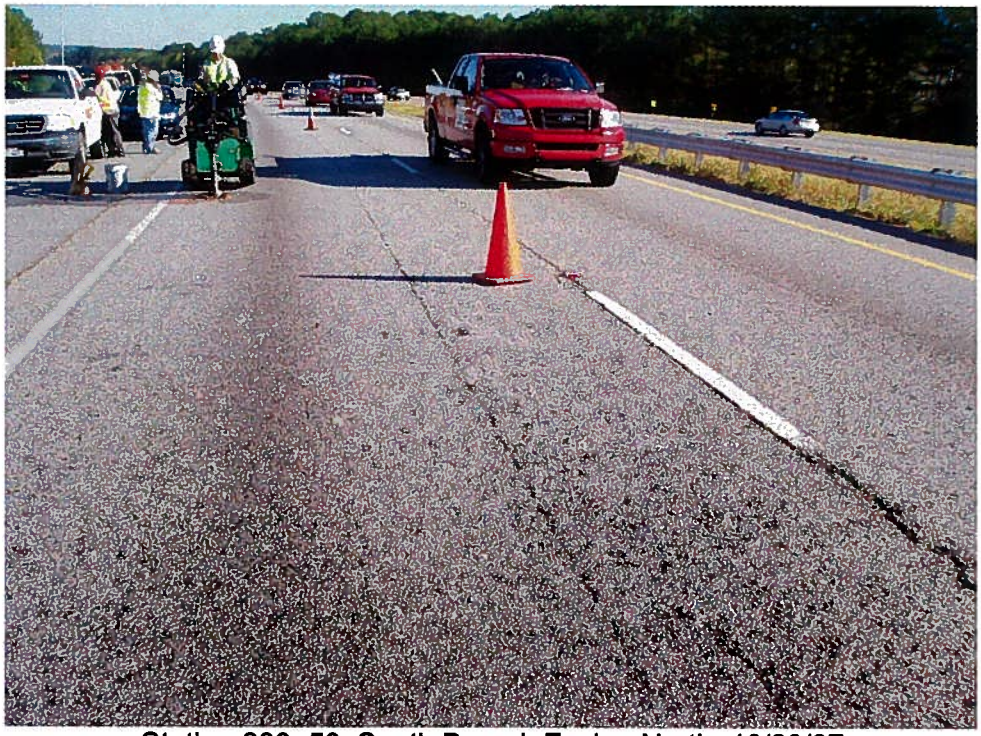
Station 119+50, South Bound, Facing South; 10/21/07

Station 165+50, South Bound, Facing North; 10/21/07

Station 165+50, South Bound, Facing South; 10/21/07

Station 205+50, South Bound, Facing North; 10/21/07

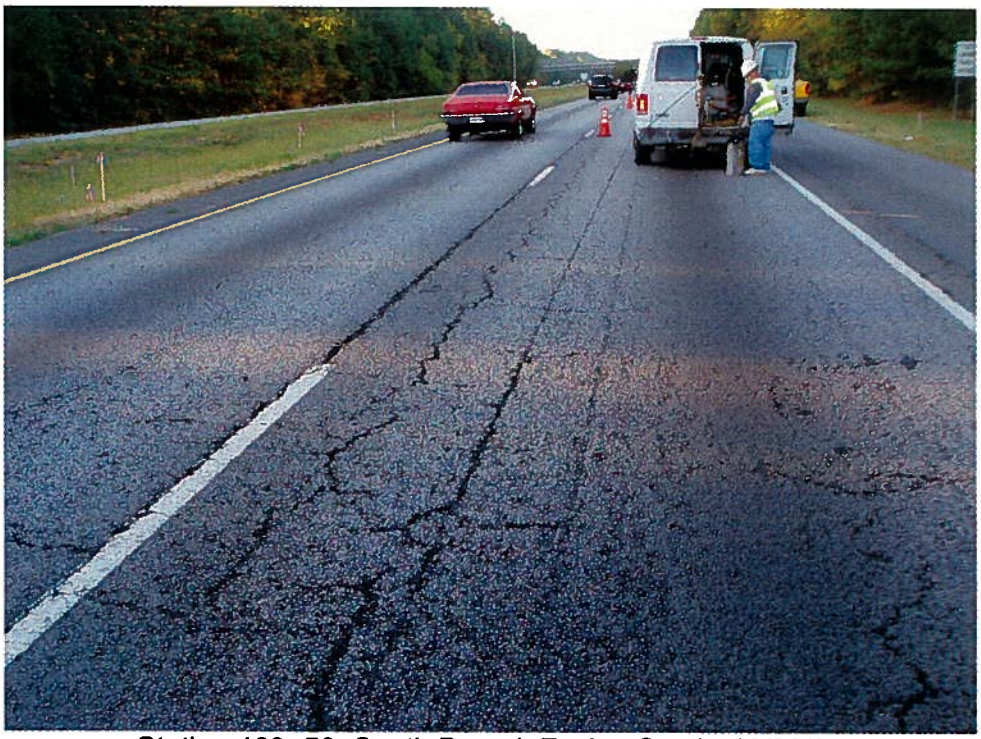
Station 205+50, South Bound, Facing South; 10/21/07



Station 280+50, South Bound, Facing North; 10/20/07

Station 280+50, South Bound, Facing South; 10/20/07

Station 469+50, South Bound, Facing North; 10/20/07



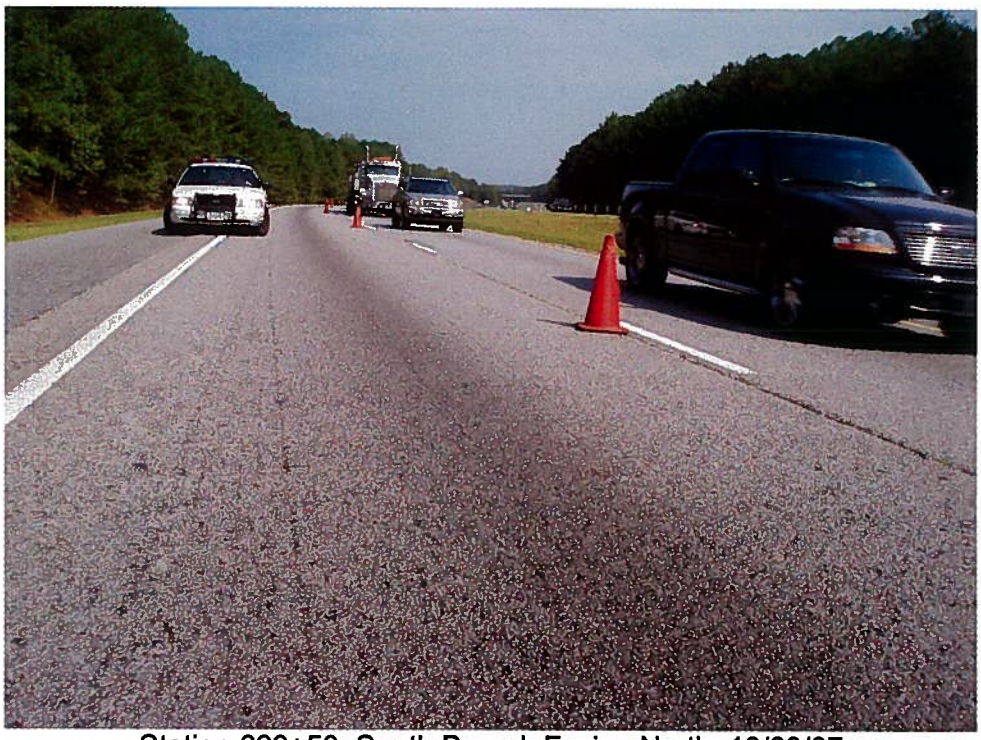
Station 469+50, South Bound, Facing South; 10/20/07

Station 485+50, South Bound, Facing North; 10/10/07

Station 485+50, South Bound, Facing South; 10/10/07

Station 550+50, South Bound, Facing North; 10/10/07

Station 550+50, South Bound, Facing South; 10/10/07

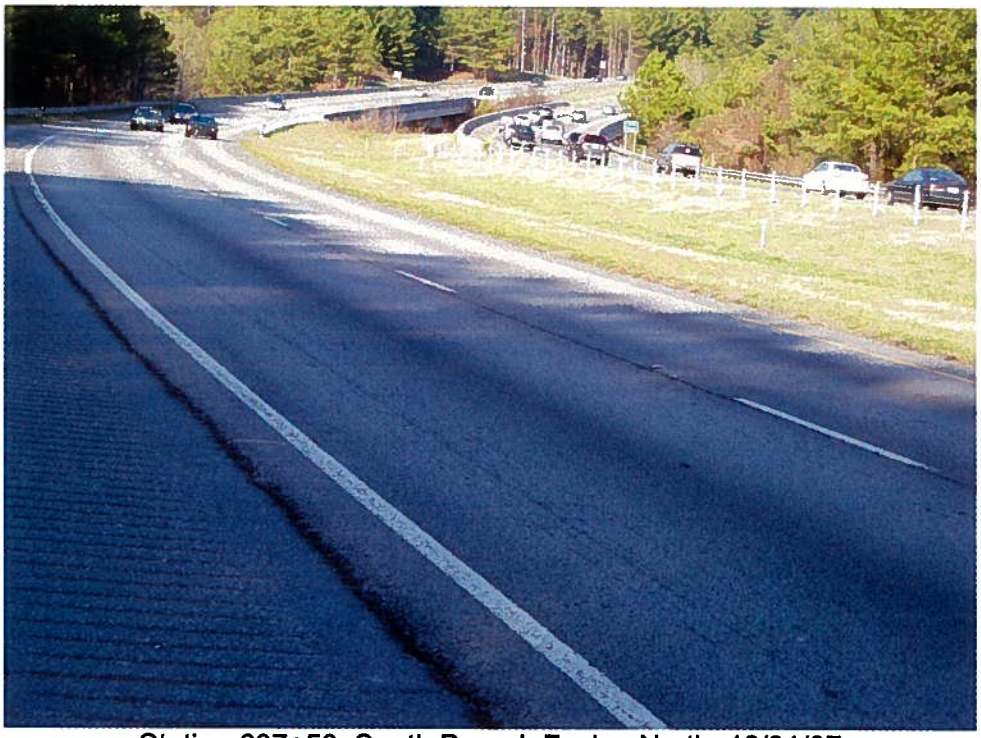


Station 629+50, South Bound, Facing North; 10/09/07

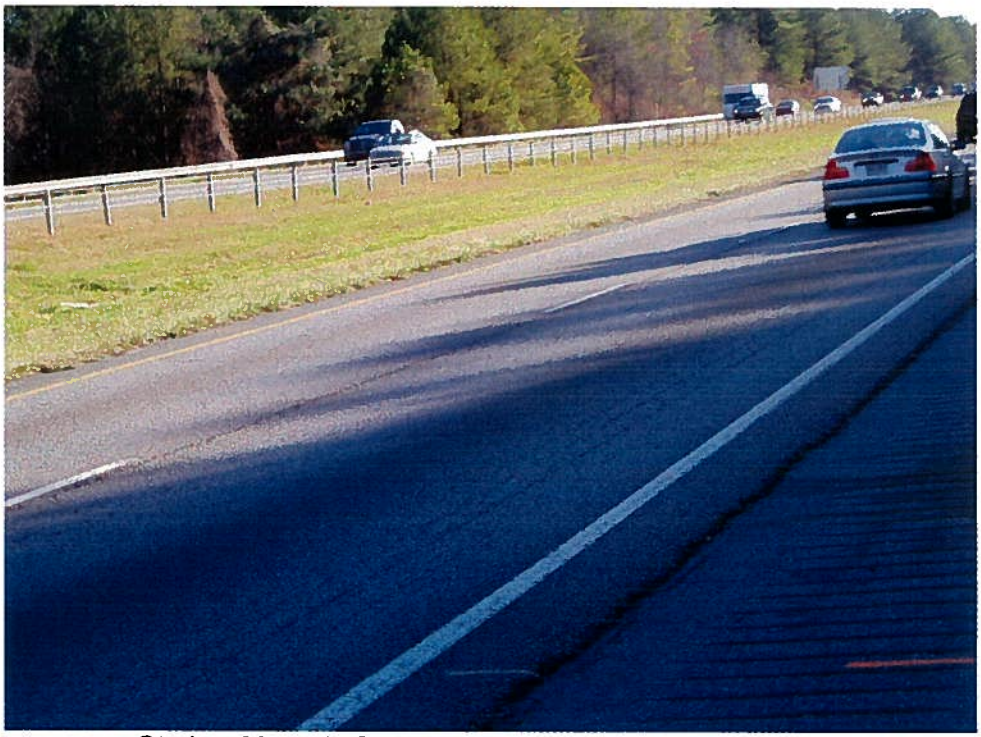
Station 629+50, South Bound, Facing South; 10/09/07

Station 642+50, South Bound, Facing North; 10/09/07

Station 642+50, South Bound, Facing South; 10/09/07



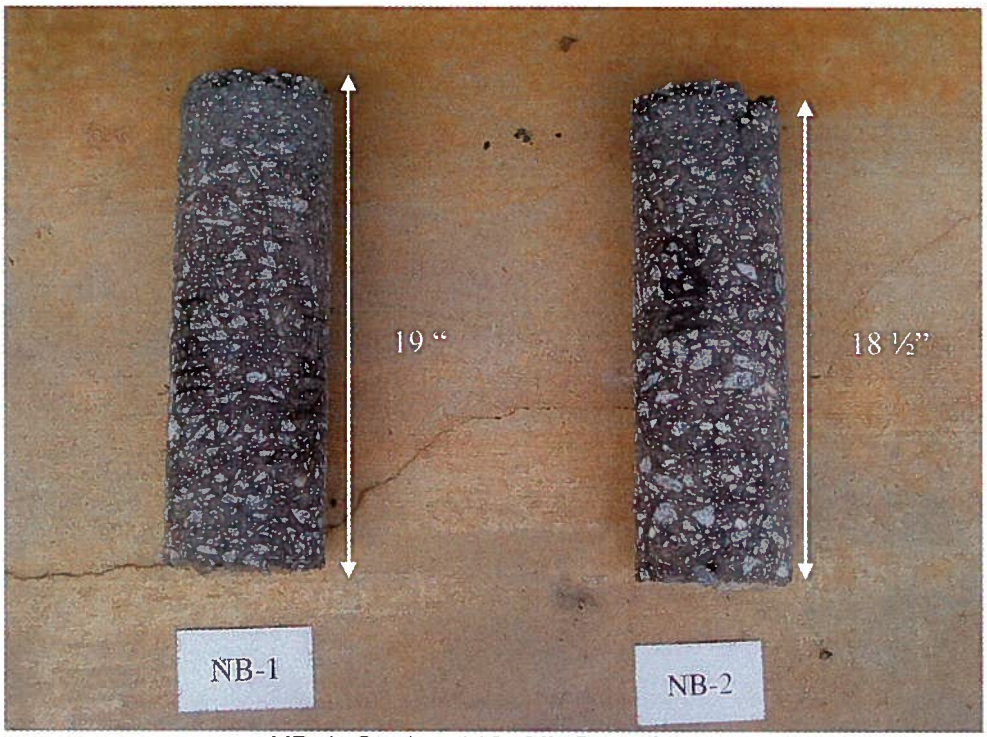
Station 697+50, South Bound, Facing North; 12/31/07



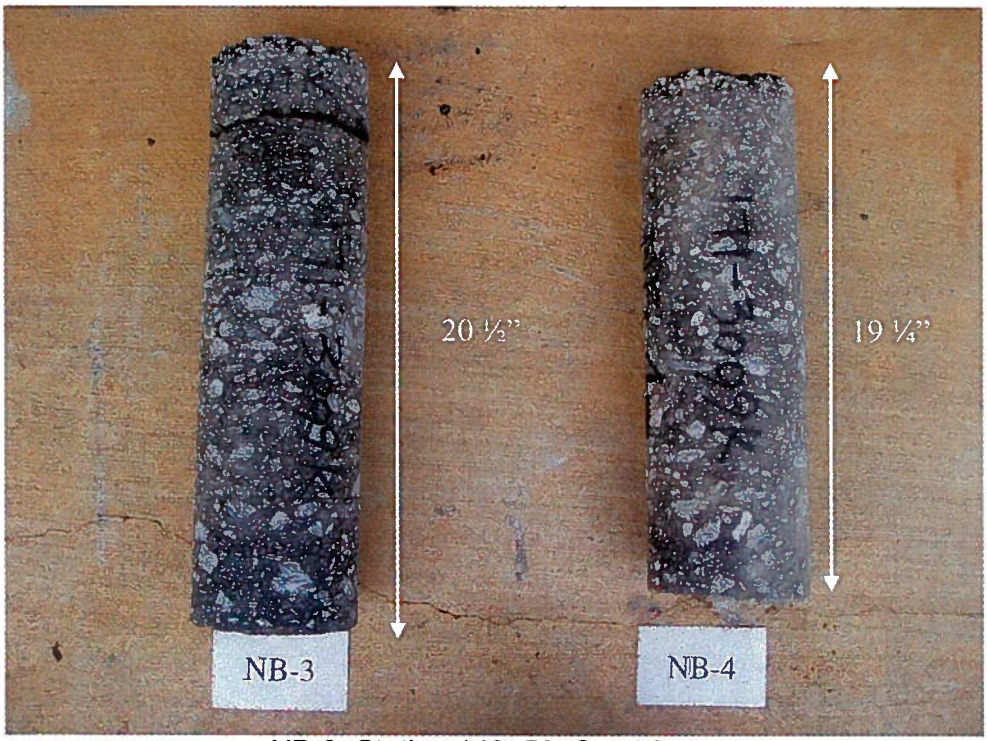
Station 697+50, South Bound, Facing South; 12/31/07

Station 754+50, South Bound, Facing North; 10/08/07

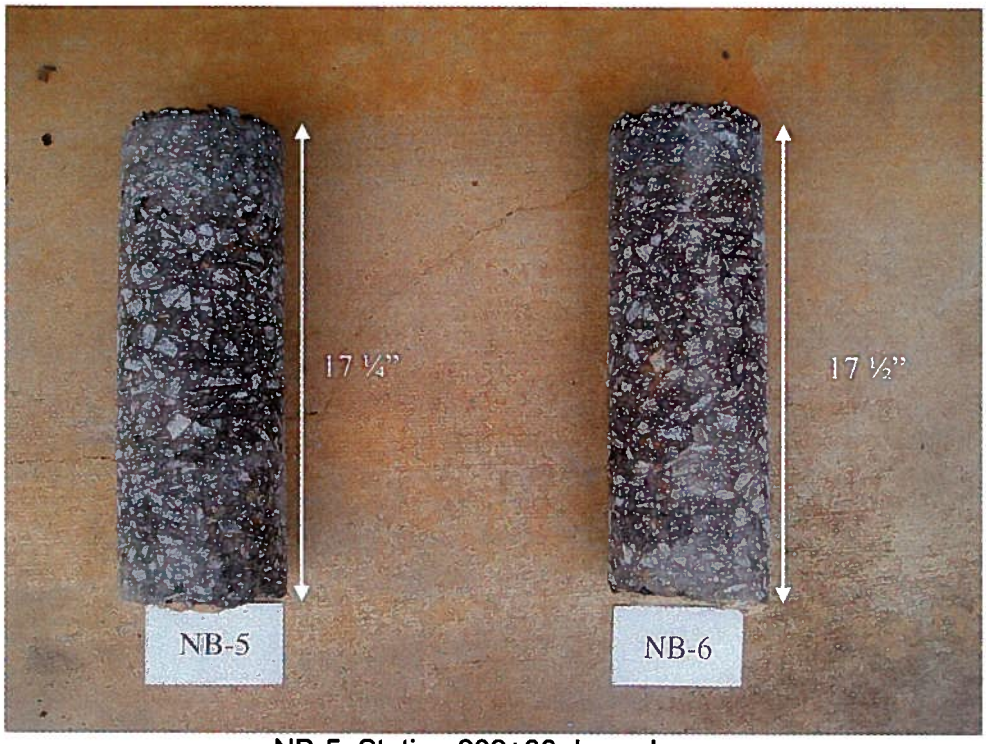
Station 754+50, South Bound, Facing South; 10/08/07



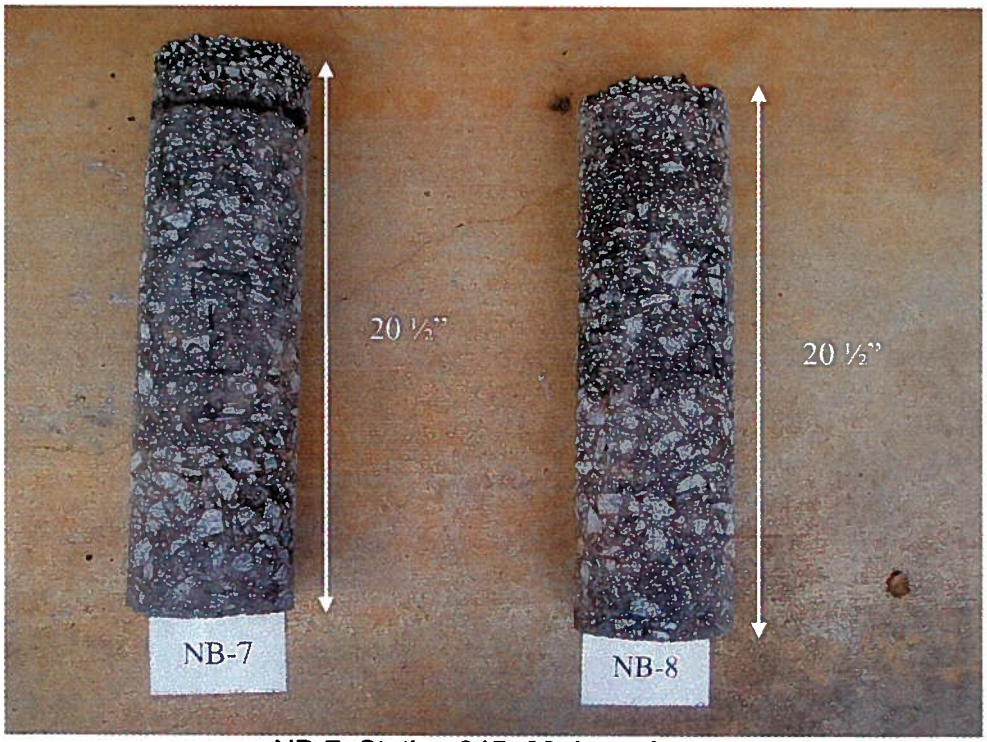

NB-1: Station 112+35, Outer Lane
NB-2: Station 130+00, Inner Lane



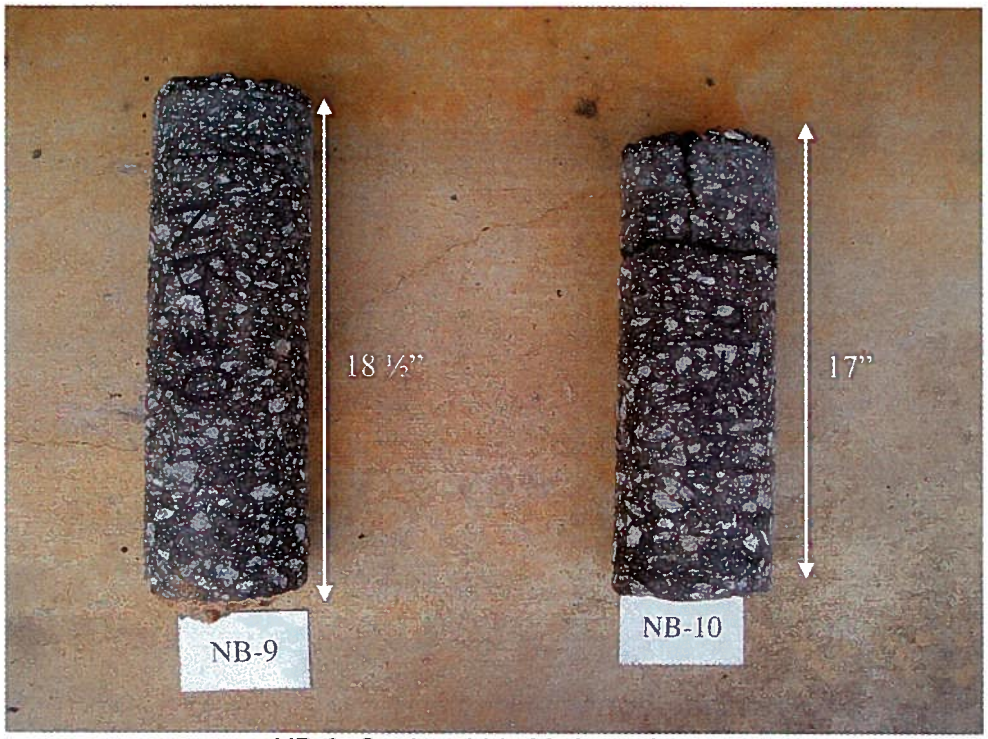

NB-3: Station 140+50, Outer Lane
NB-4: Station 175+00, Inner Lane



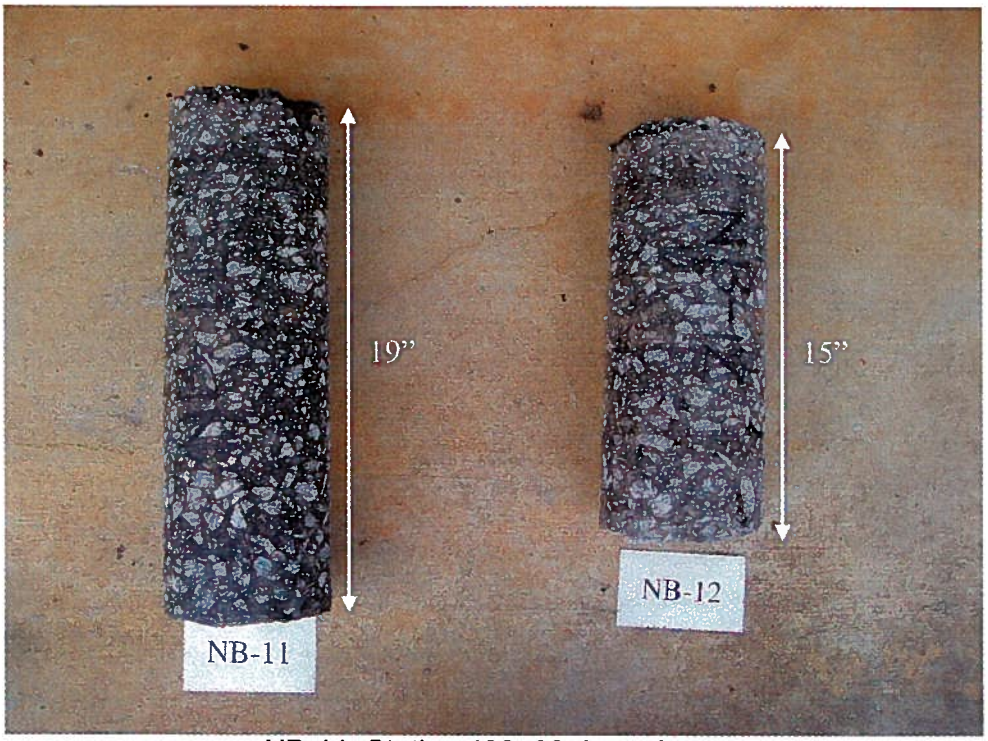

NB-5: Station 202+00, Inner Lane
NB-6: Station 220+00, Outer Lane



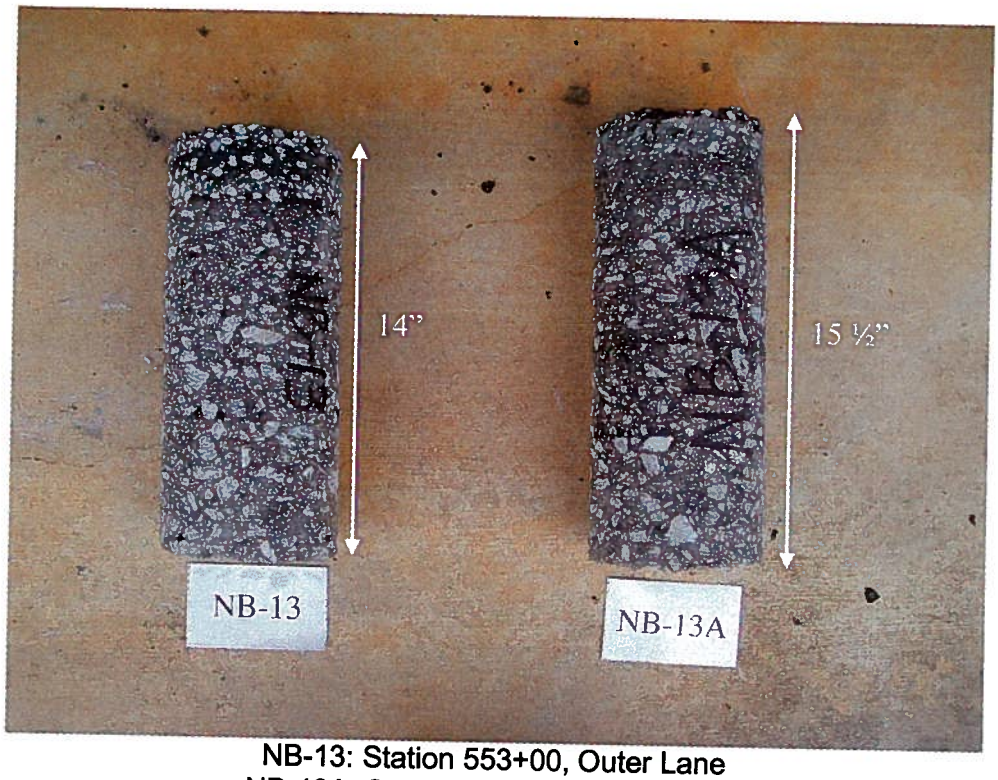

NB-7: Station 245+00, Inner Lane
NB-8: Station 270+50, Outer Lane



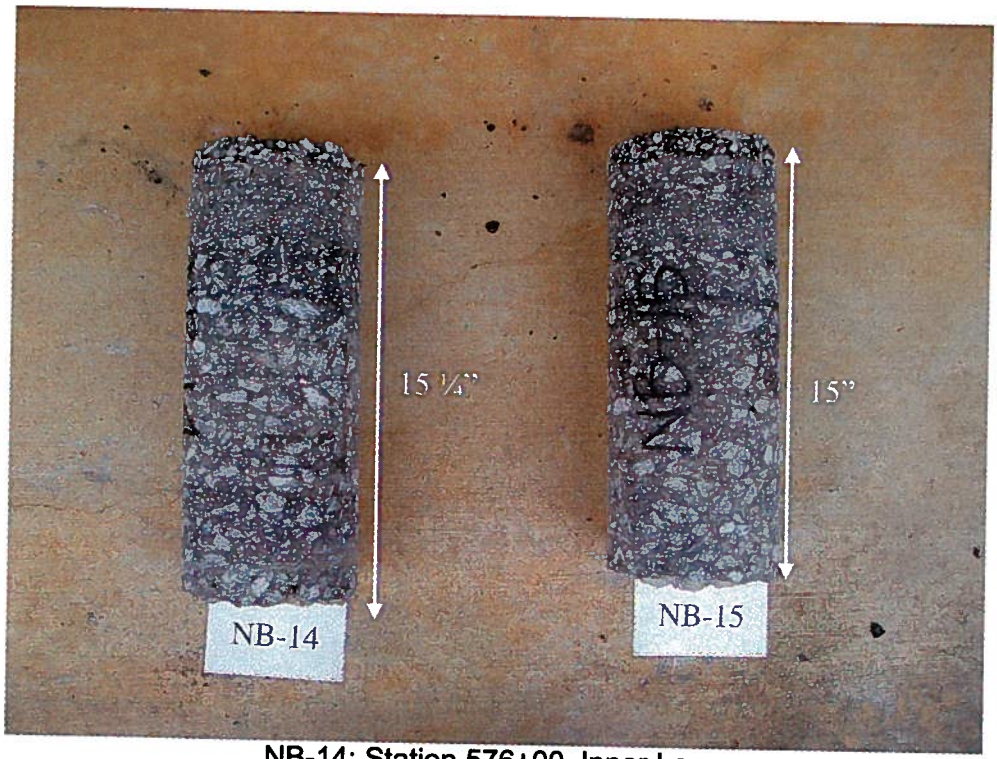

NB-9: Station 444+00, Inner Lane
NB-10: Station 471+00, Outer Lane



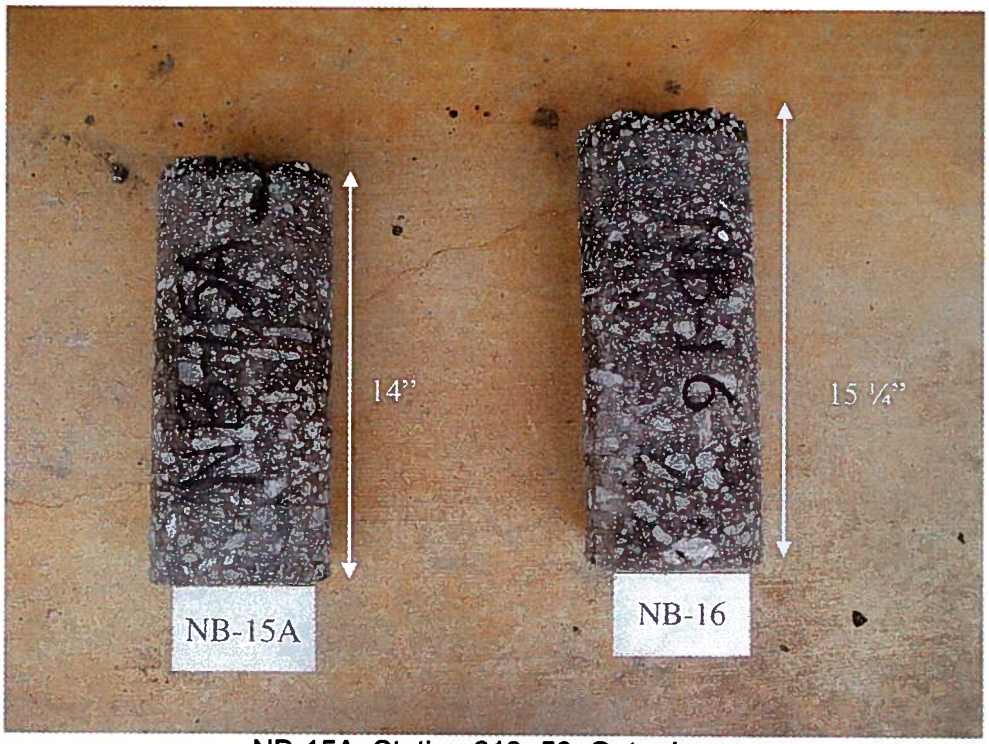

NB-11: Station 498+00, Inner Lane
NB-12: Station 529+50, Outer Lane



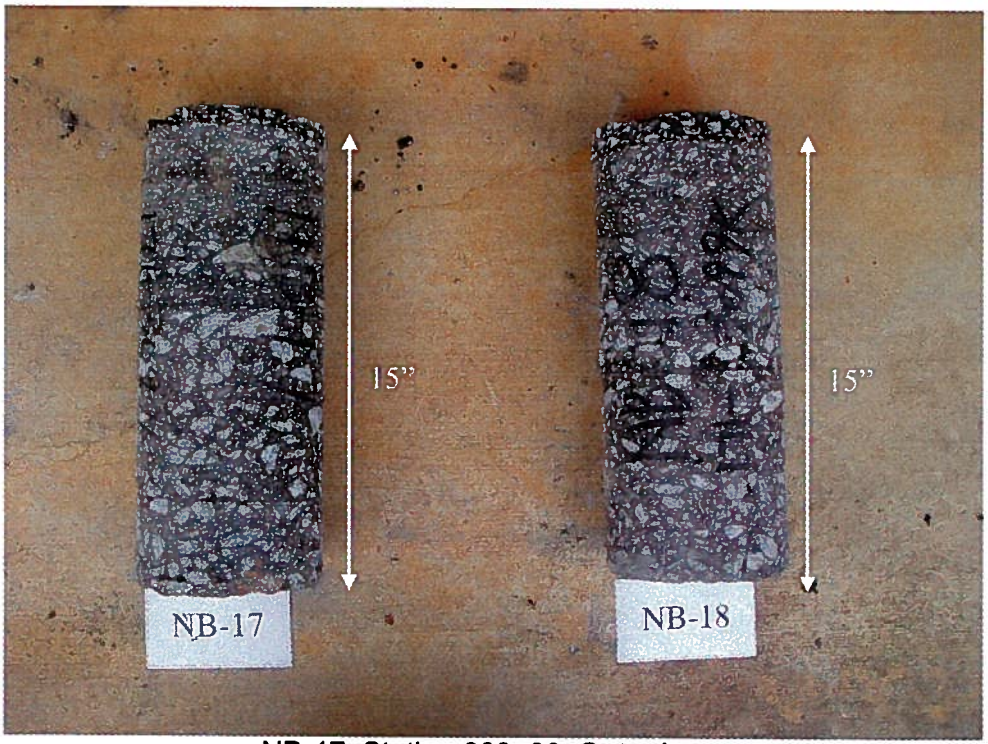

NB-13: Station 553+00, Outer Lane
NB-13A: Station 558+00, Middle Lane



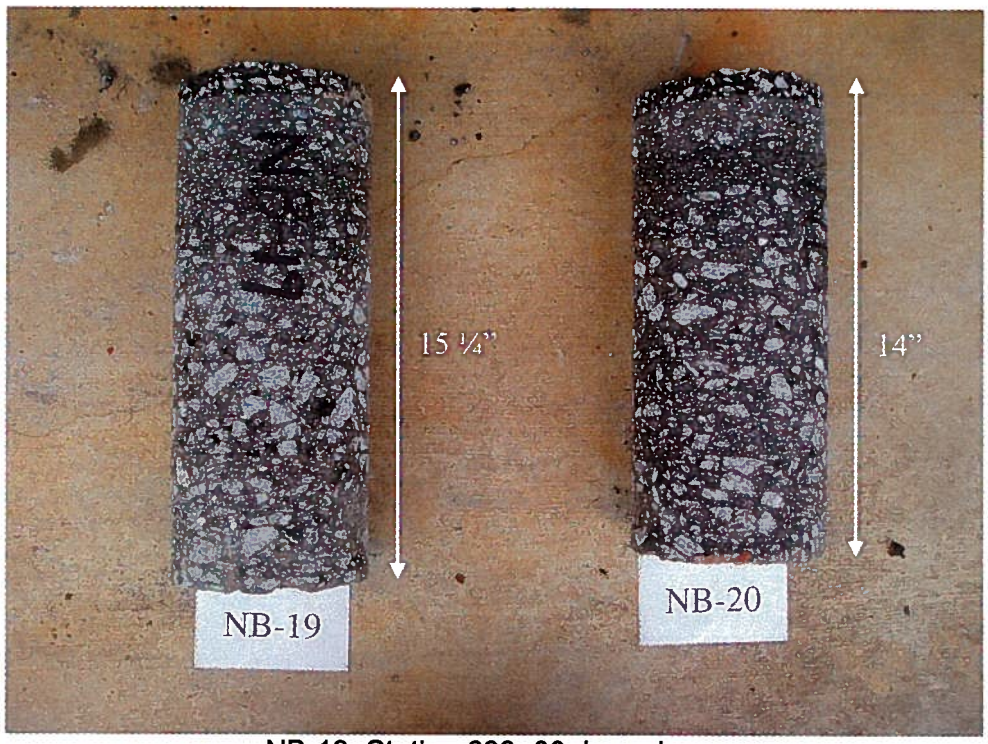

NB-14: Station 576+00, Inner Lane
NB-15: Station 605+00, Middle Lane



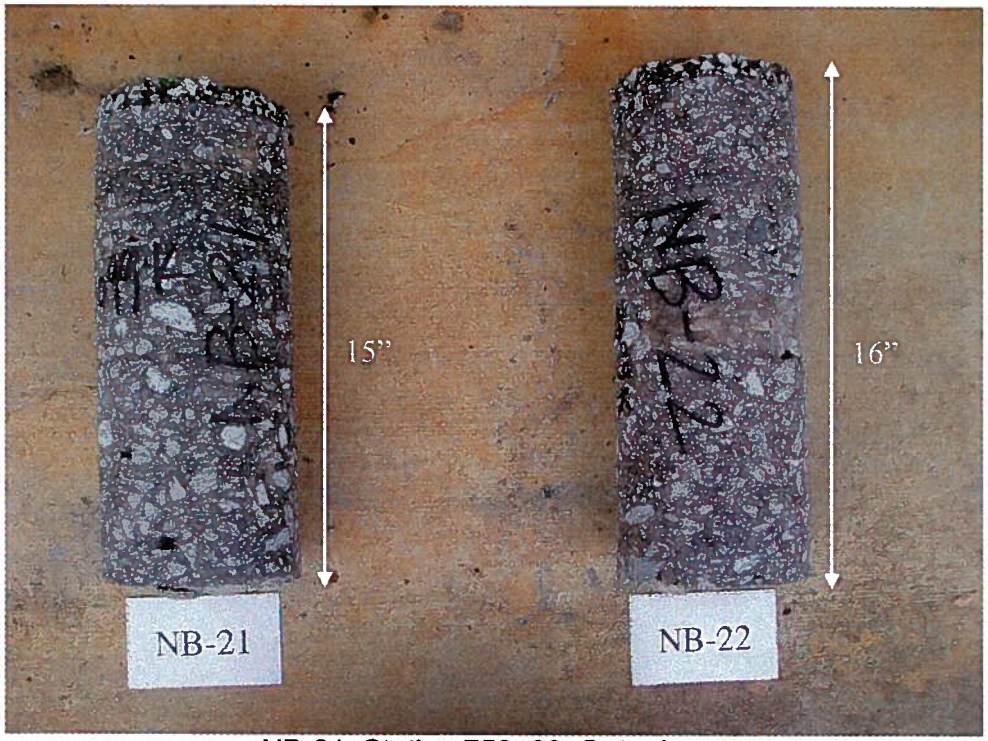

NB-15A: Station 619+50, Outer Lane
NB-16: Station 631+00, Inner Lane



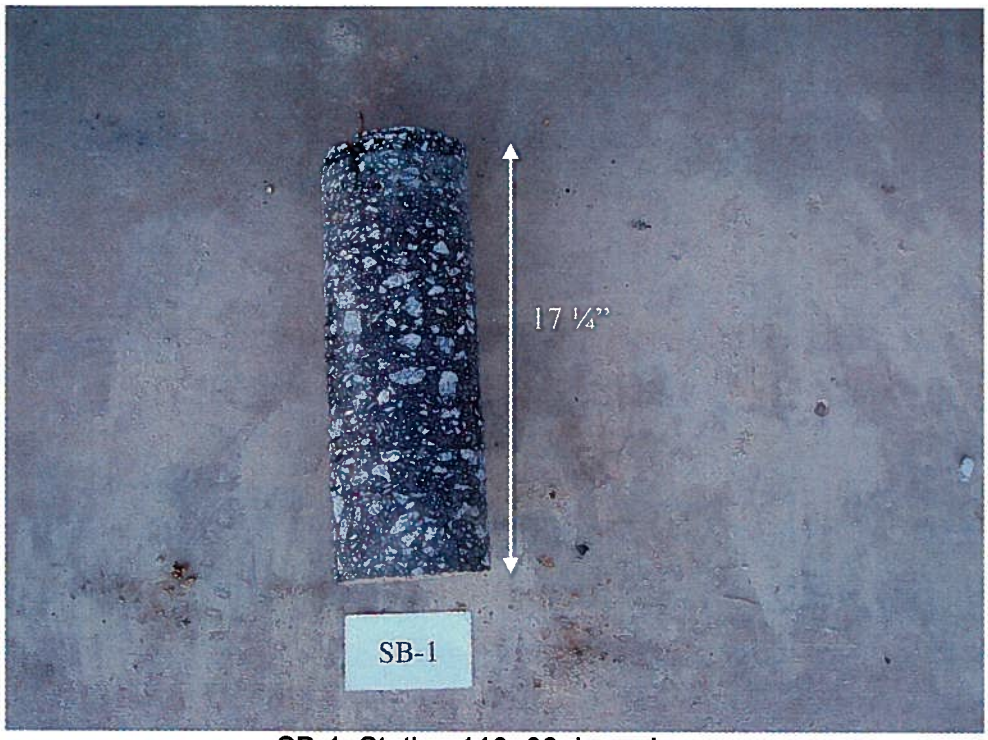

NB-17: Station 660+00, Outer Lane
NB-18: Station 685+00, Inner Lane



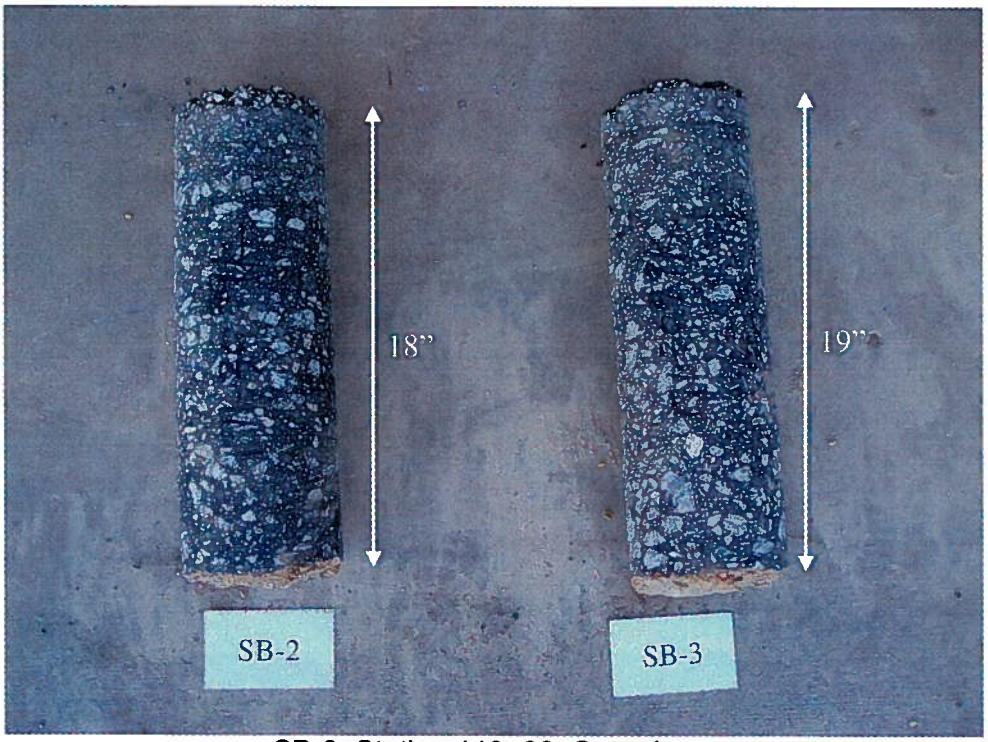

NB-19: Station 699+00, Inner Lane
NB-20: Station 720+00, Outer Lane



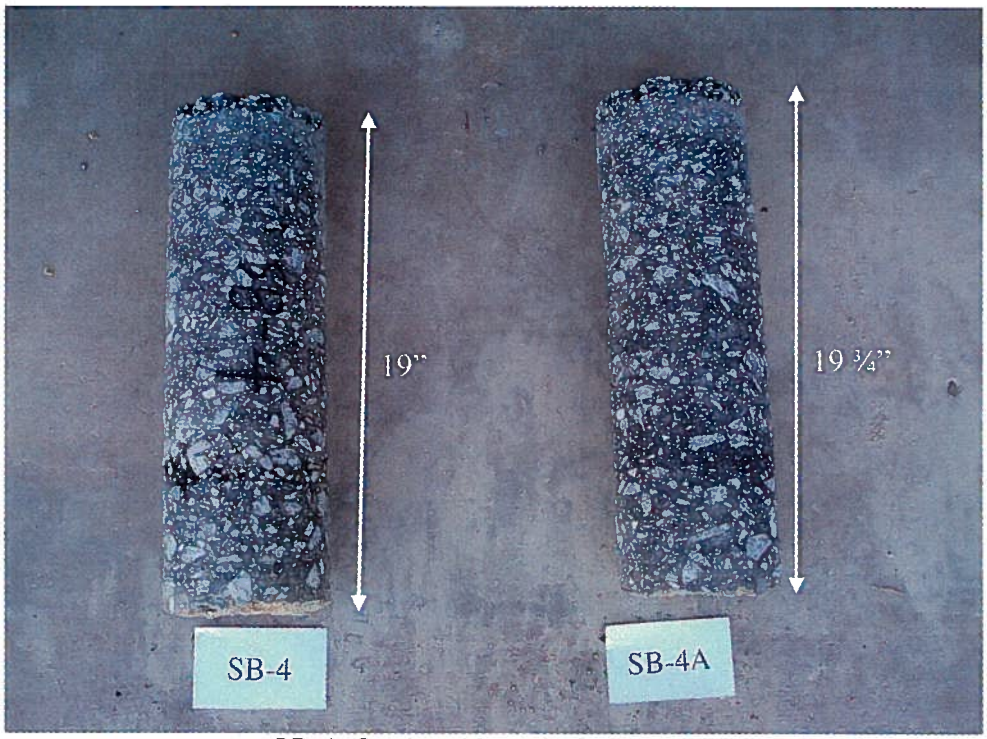

NB-21: Station 750+00, Outer Lane
NB-22: Station 755+00, Inner Lane



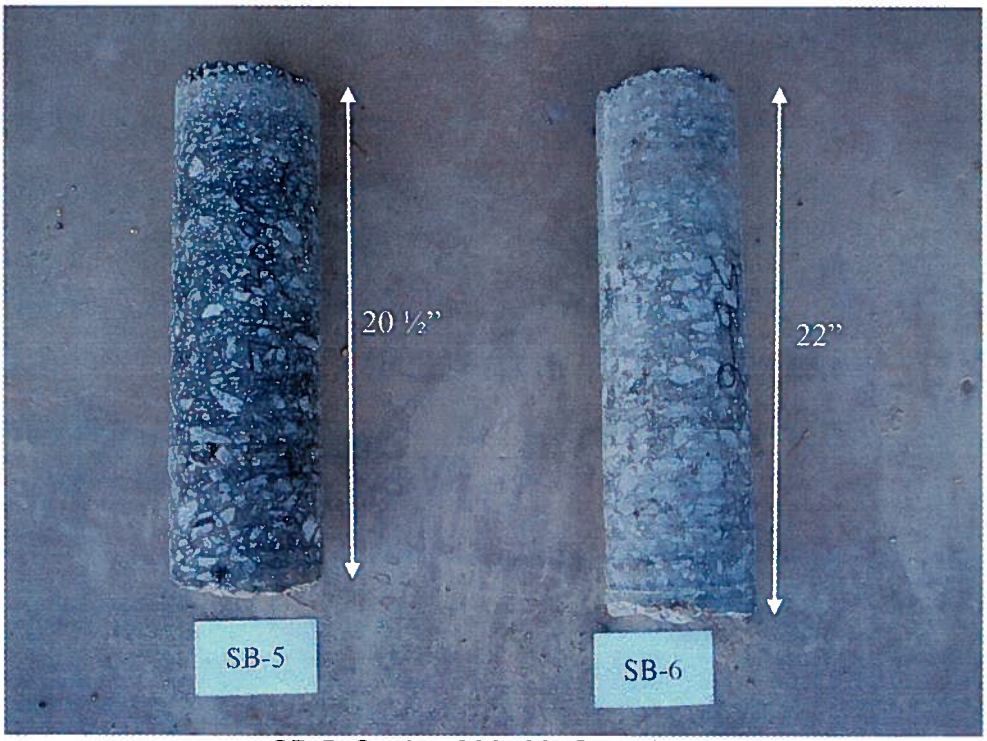

SB-1: Station 110+00, Inner Lane



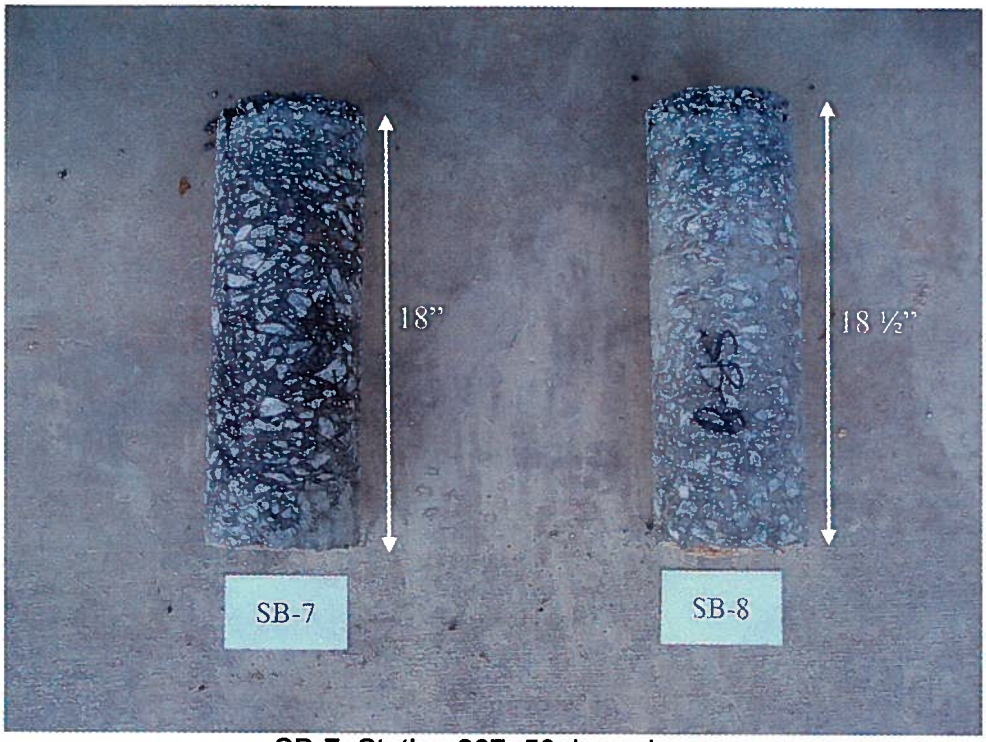

SB-2: Station 119+00, Outer Lane
SB-3: Station 166+00, Inner Lane



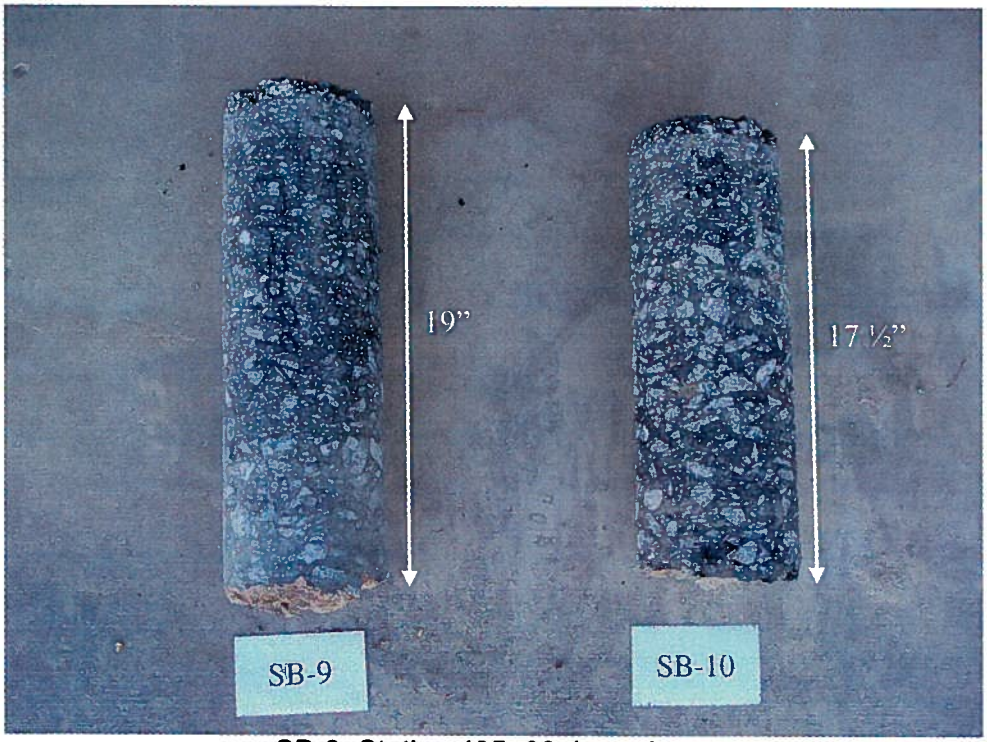

SB-4: Station 165+50, Outer Lane
SB-4A: Station 195+00, Middle Lane



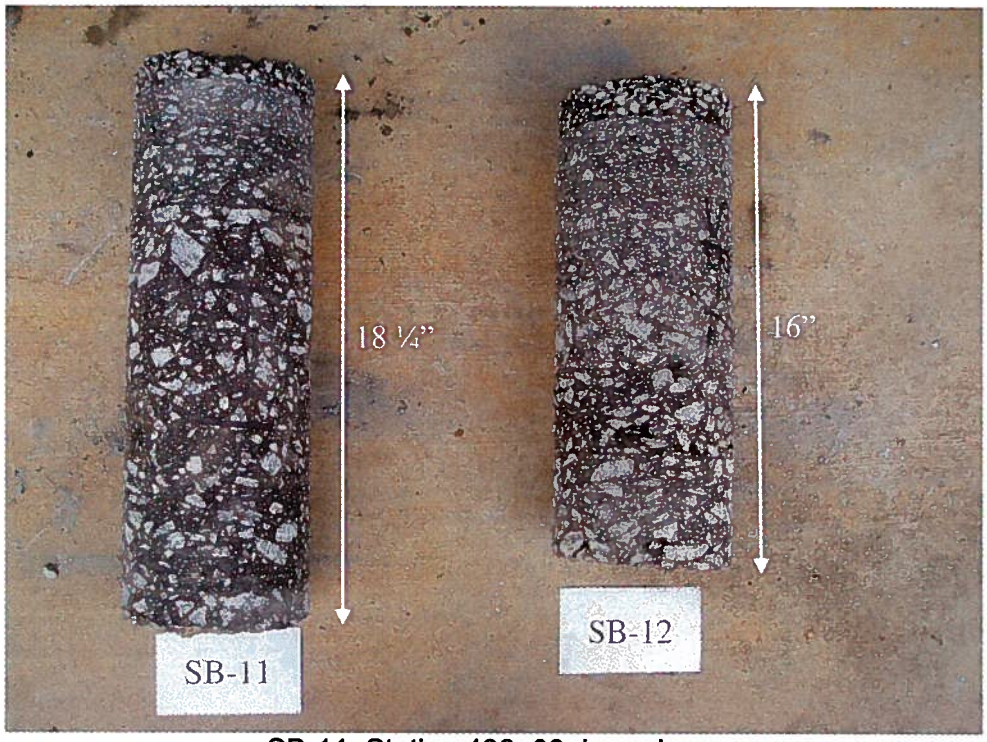

SB-5: Station 206+00, Outer Lane
SB-6: Station 230+00, Inner Lane



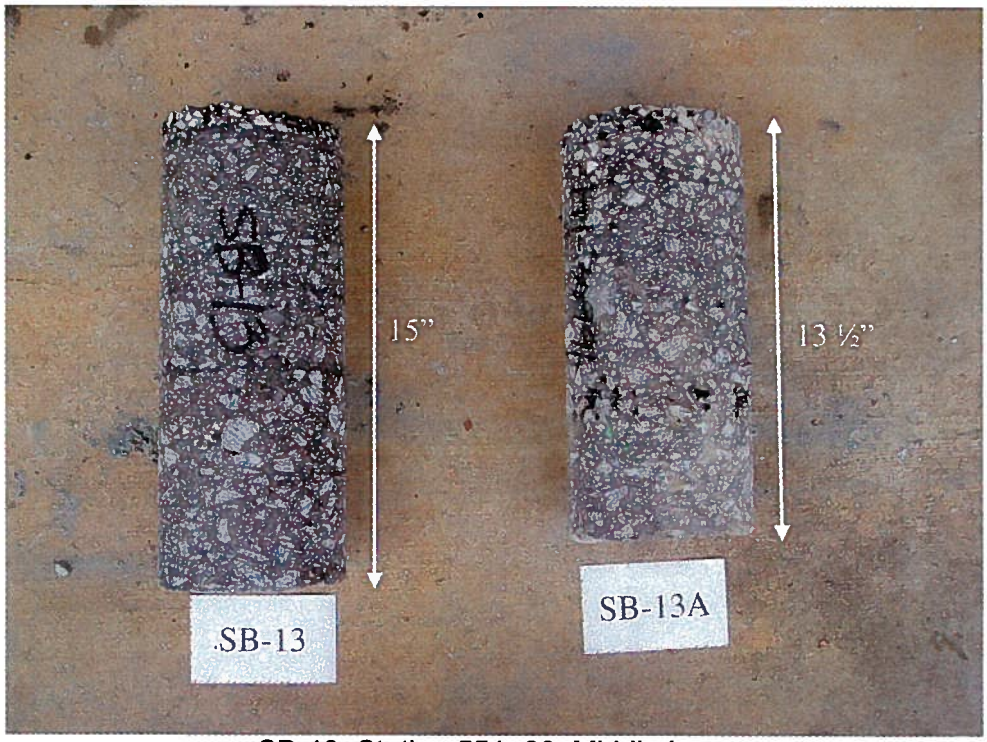

SB-7: Station 267+50, Inner Lane
SB-8: Station 281+00, Outer Lane



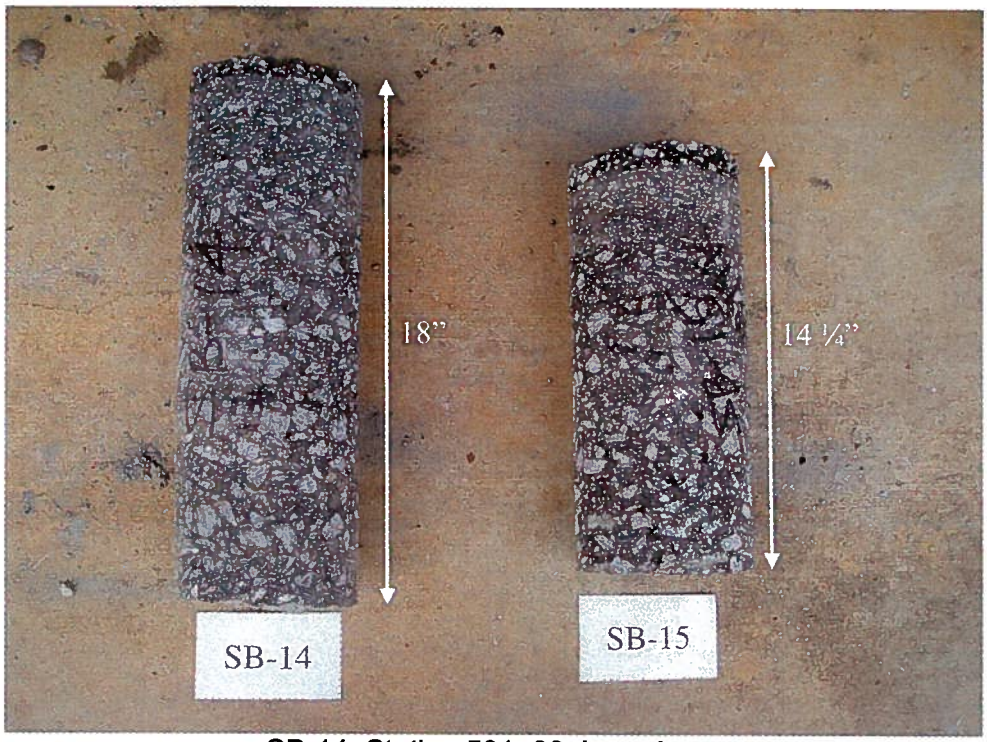

SB-9: Station 435+00, Inner Lane
SB-10: Station 469+00, Outer Lane




SB-11: Station 486+00, Inner Lane
SB-12: Station 520+00, Outer Lane

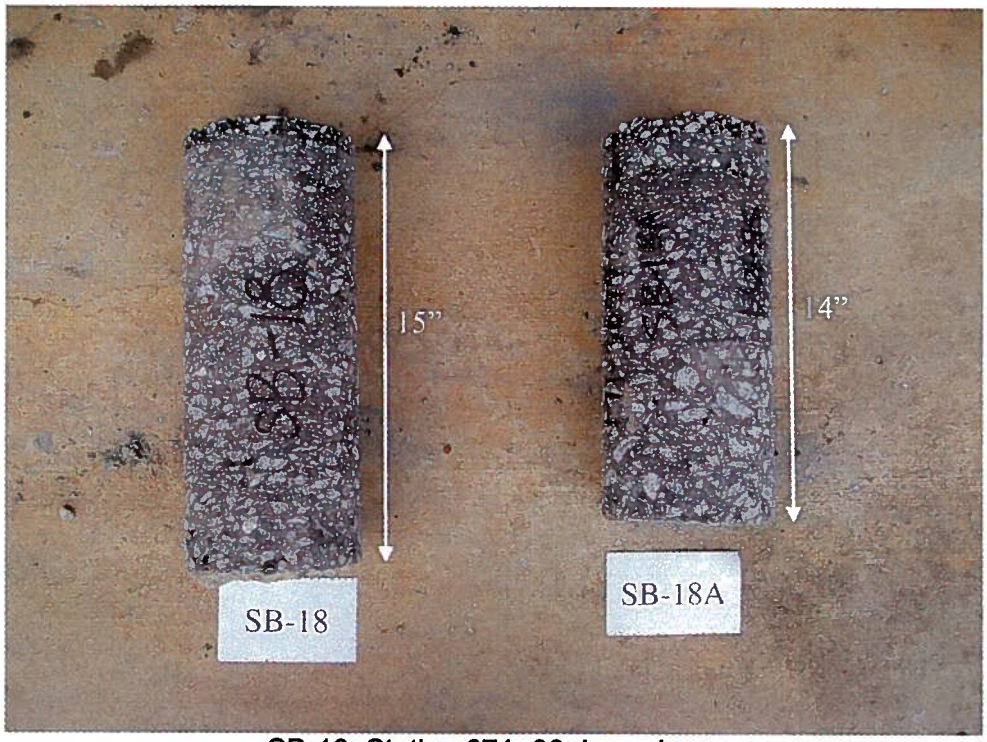



SB-13: Station 551+00, Middle Lane
SB-13A: Station 550+00, Outer Lane

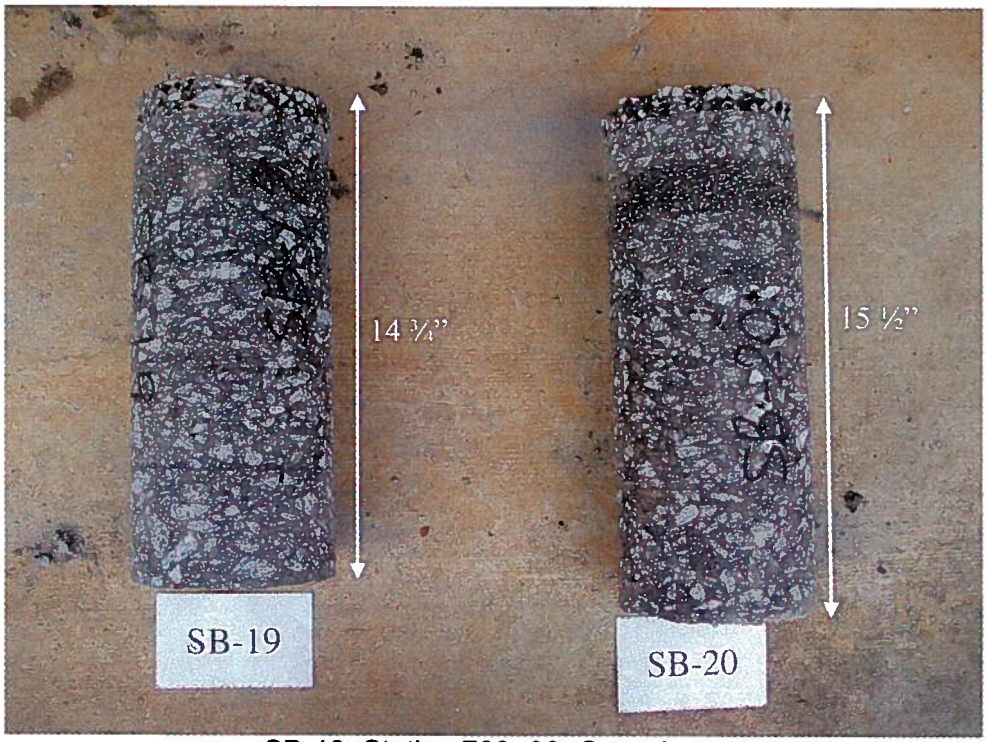



SB-14: Station 581+00, Inner Lane
SB-15: Station 609+50, Outer Lane

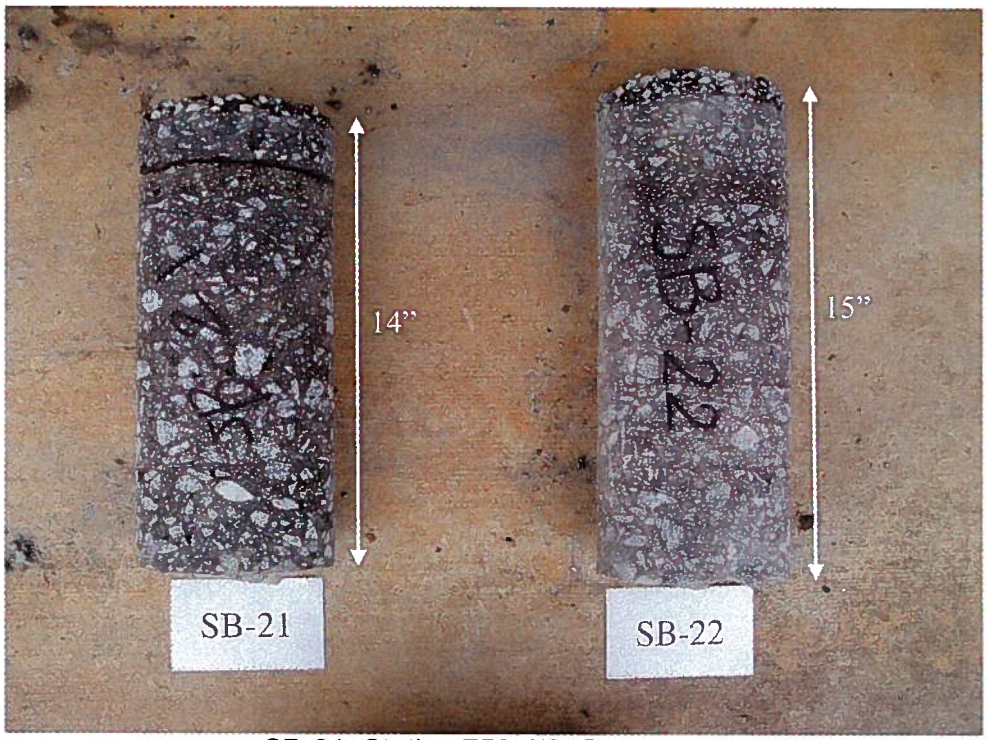

SB-16: Station 626+00, Inner Lane
SB-17: Station 642+50, Outer Lane



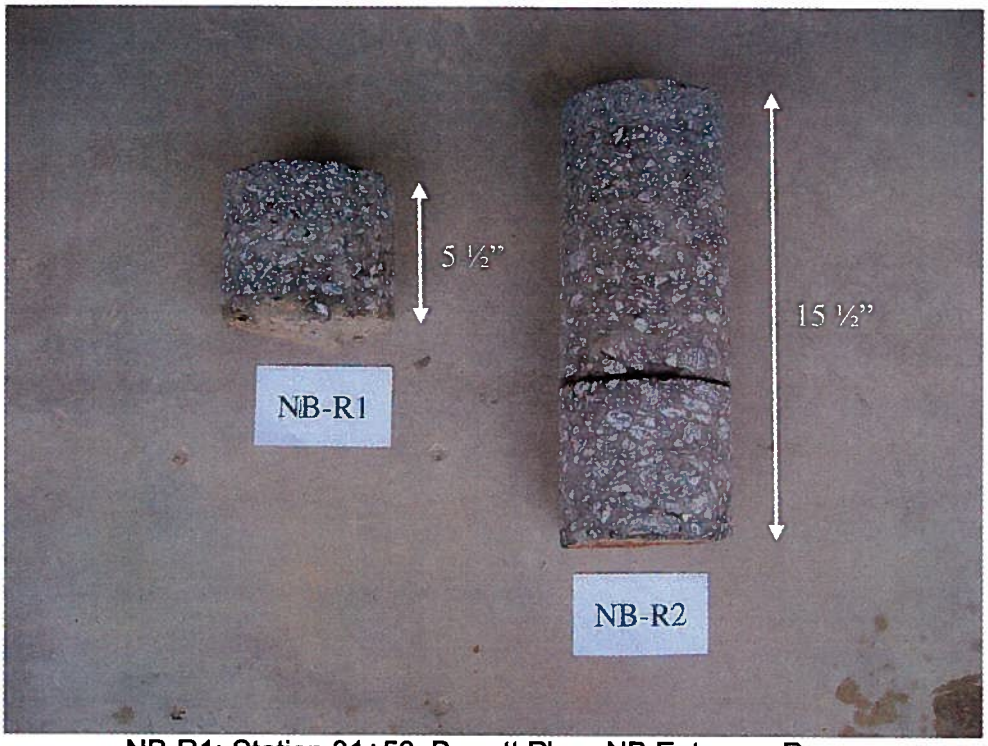

SB-18: Station 671+00, Inner Lane
SB-18A: Station 655+50, Outer Lane



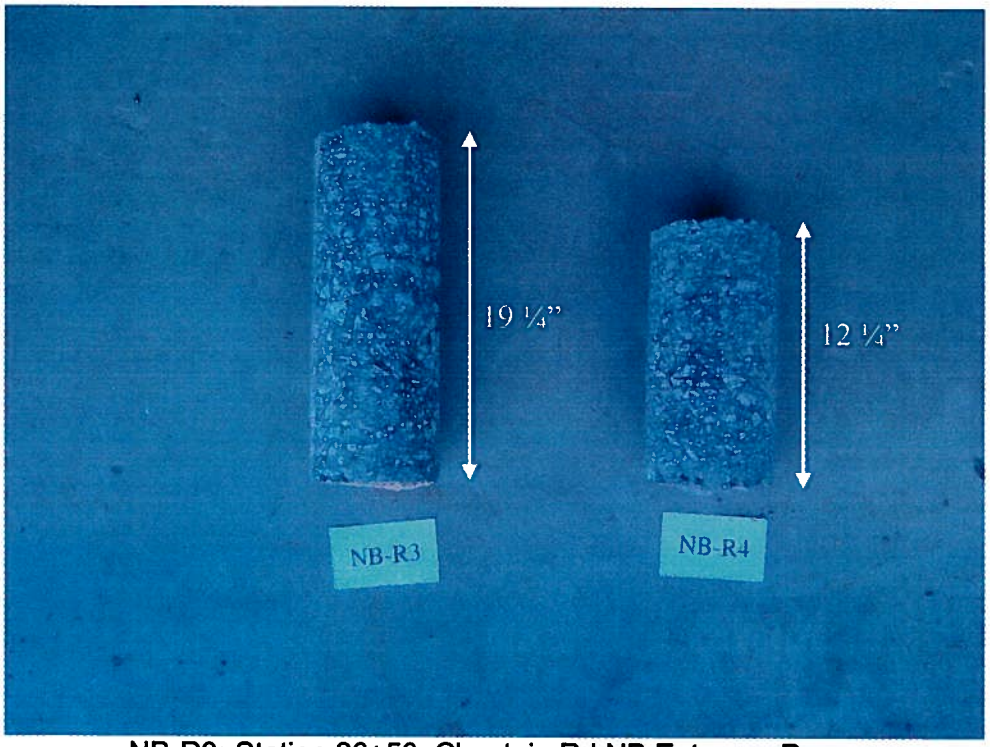

SB-19: Station 700+00, Outer Lane
SB-20: Station 730+00, Inner Lane



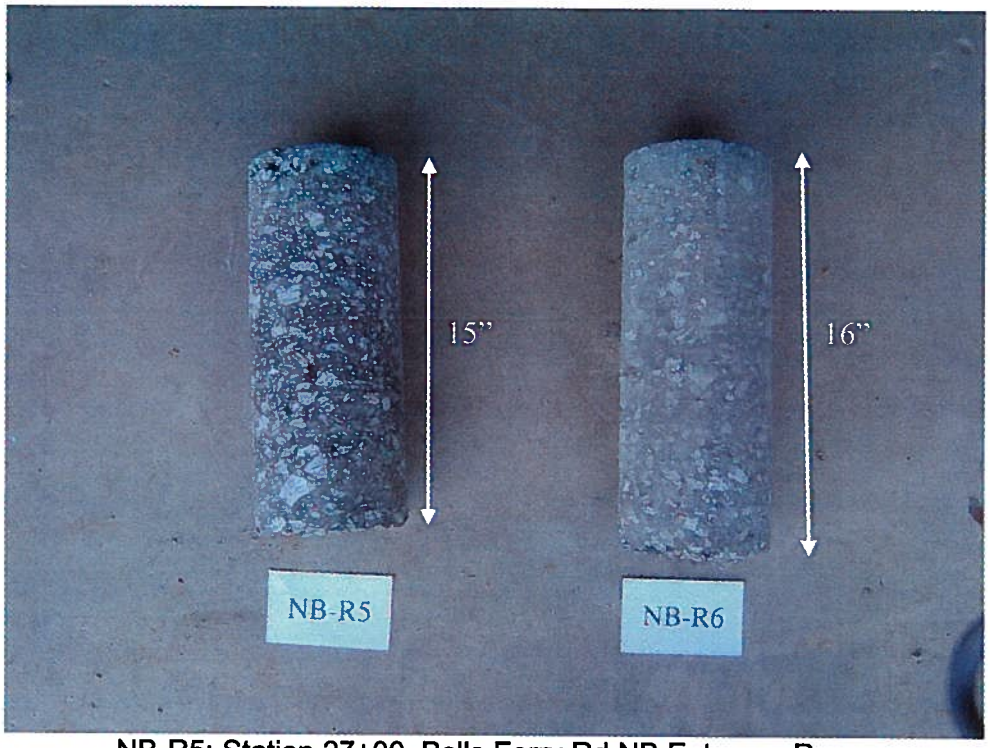

SB-21: Station 750+70, Outer Lane
SB-22: Station 755+00, Inner Lane



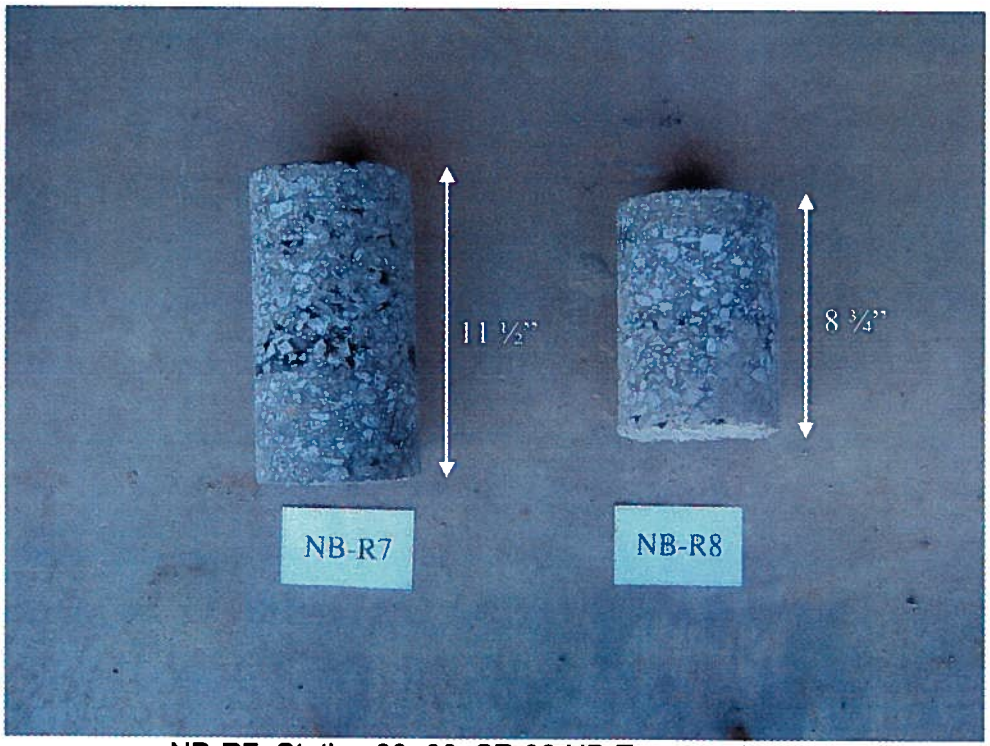

NB-R1: Station 31+50, Barrett Pkwy NB Entrance Ramp
NB-R2: Station 37+50, Chastain Rd NB Exit Ramp



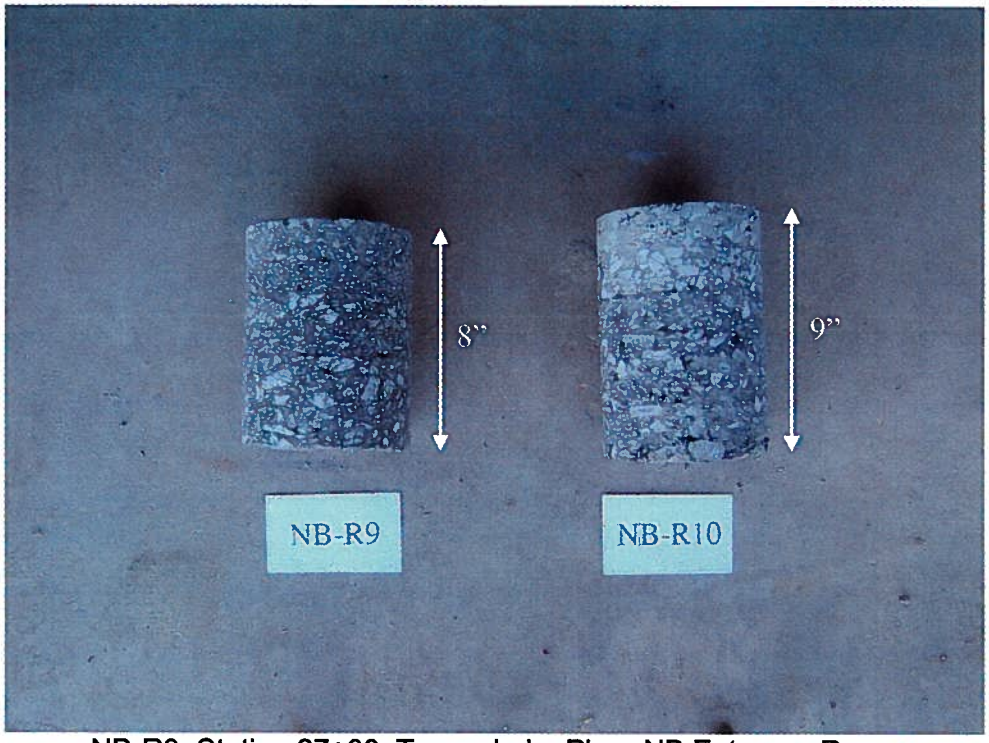

NB-R3: Station 26+50, Chastain Rd NB Entrance Ramp
NB-R4: Station 42+00, Bells Ferry Rd NB Exit Ramp



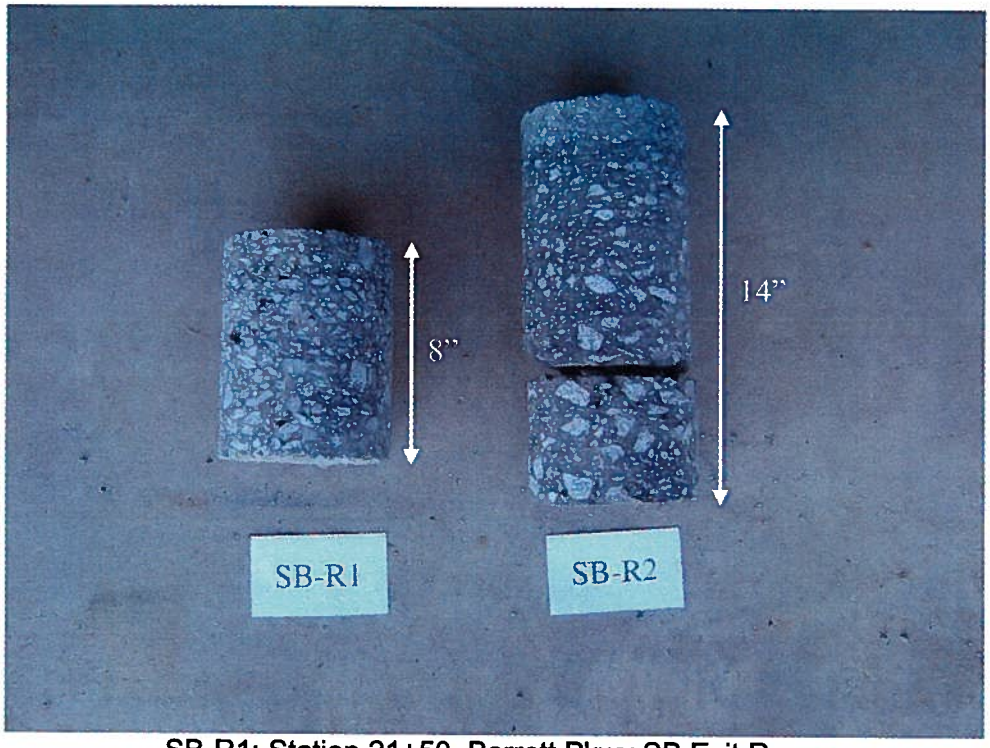

NB-R5: Station 27+00, Bells Ferry Rd NB Entrance Ramp
NB-R6: Station 39+50, SR 92 NB Exit Ramp



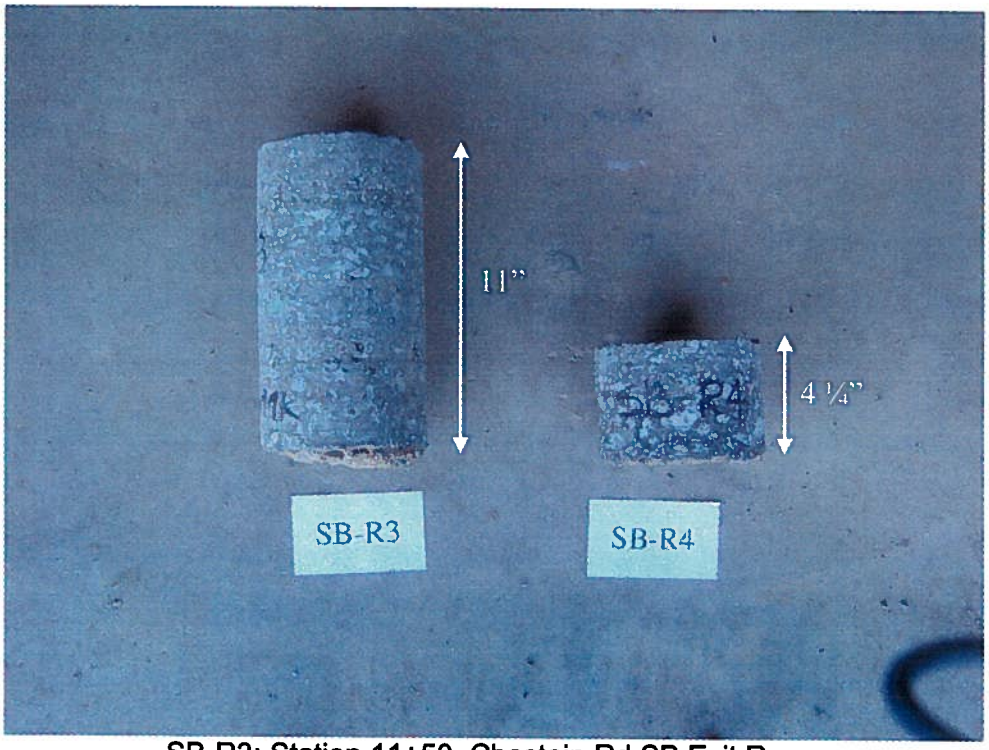

NB-R7: Station 33+00, SR 92 NB Entrance Ramp
NB-R8: Station 37+50, Towne Lake Pkwy NB Exit Ramp



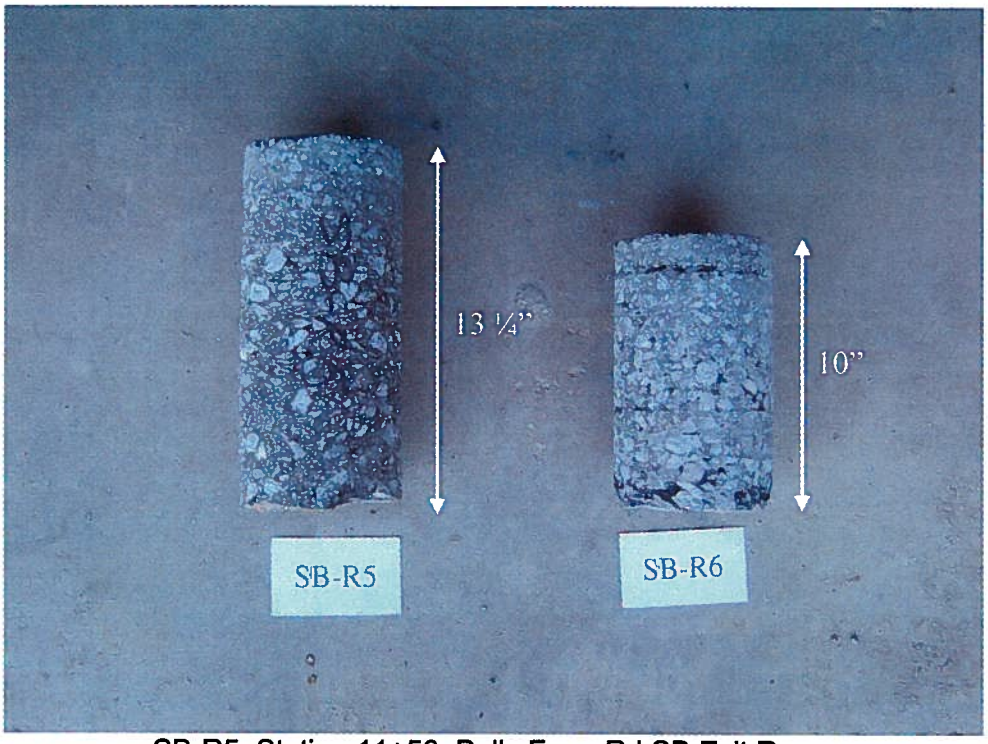

NB-R9: Station 27+00, Towne Lake Pkwy NB Entrance Ramp
NB-R10: Station 37+00, Sixes Rd NB Exit Ramp



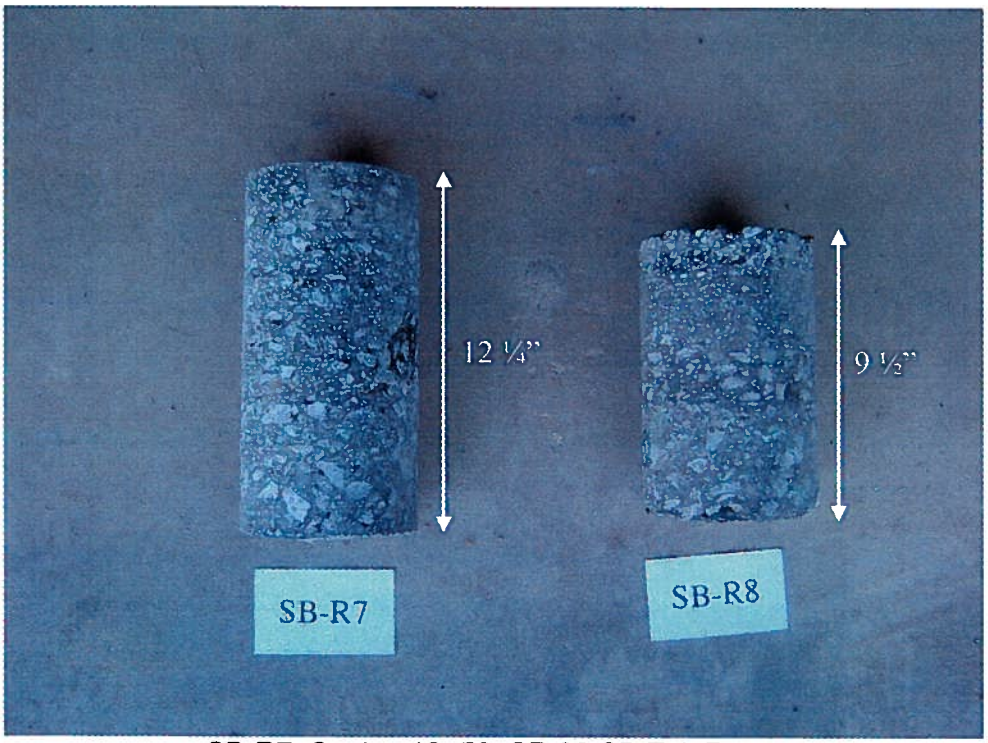

SB-R1: Station 21+50, Barrett Pkwy SB Exit Ramp
SB-R2: Station 17+00, Chastain Rd SB Entrance Ramp



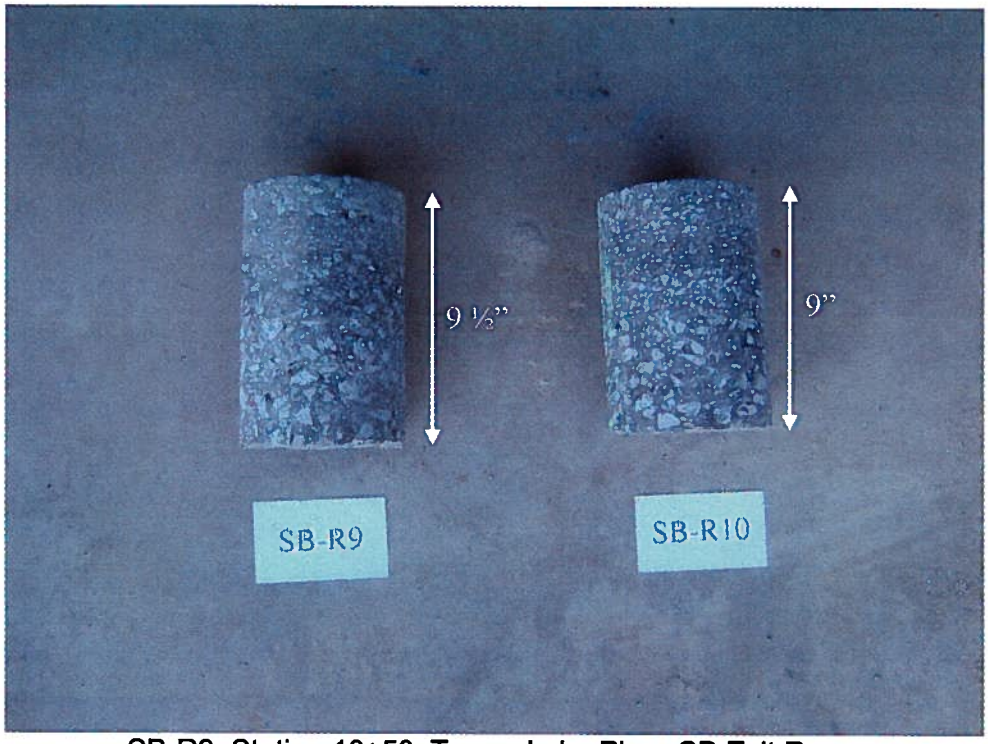

SB-R3: Station 11+50, Chastain Rd SB Exit Ramp
SB-R4: Station 23+00, Bells Ferry Rd SB Entrance Ramp




SB-R5: Station 11+50, Bells Ferry Rd SB Exit Ramp
SB-R6: Station 16+00, SR 92 SB Entrance Ramp




SB-R7: Station 12+50, SR 92 SB Exit Ramp
SB-R8: Station 17+00, Towne Lake Pkwy SB Entrance Ramp




SB-R9: Station 10+50, Towne Lake Pkwy SB Exit Ramp
SB-R10: Station 20+00, Sixes Rd SB Entrance Ramp

# FLEXIBLE PAVEMENT DESIGN ANALYSIS

**Project:** CSNHS-0008-00(256) **County:** Cobb
**P.I. no.:** 0008256
**Description:** I-575 full depth section from Barrett Parkway to SR 92

**Traffic Data** (NOTE: AADTs are one-way)
24-hour Truck Percentage: 13.70%
AADT initial year of design period: 44,502 vpd (2015)
AADT final year of design period: 51,152 vpd (2035)
Mean AADT (one-way): 47,827 vpd

**Design Loading**

| Mean AADT | | LDF | | Trucks | | 18-K ESAL | | Total Daily Loads |
|---|---|---|---|---|---|---|---|---|
| 47,827 | * | 0.80 | * | 0.137 | * | 1.28 | = | 6,711 |

Total predicted design period loading = 6711 * 20 * 365 = 48,990,300

**Design Data**
Terminal Serviceability Index: 2.50
Soil Support: 2.00
Regional Factor: 1.80

**PROPOSED FLEXIBLE PAVEMENT STRUCTURE**

| Material | Thickness Inches | Thickness (mm) | Structural Coefficient | Structural Value |
|---|---|---|---|---|
| 12.5 mm PEM | 135 lb/sy | (75 kg/sm) | 0.00 | 0.00 |
| 12.5 mm SMA | 2.00 | (51) | 0.44 | 0.88 |
| 19 mm Superpave | 2.00 | (51) | 0.44 | 0.88 |
| 25 mm Superpave | 0.50 | (13) | 0.44 | 0.22 |
| | 11.50 | (292) | 0.30 | 3.45 |
| Graded Aggregate Base | 12.00 | (305) | 0.16 | 1.92 |

Required SN = 8.15 Proposed SN = 7.35

**>>> Proposed pavement is 9.9% Underdesign <<<**

**Remarks:** Willmer Engineering Inc.

**Prepared by** Paul Zhang, PE/Jim Willmer, PE January 23, 2008
**Date**

**Recommended** _____
**State Urban Design Engineer** **Date**

**Approved** _____
**State Pavement Engineer** **Date**

# FLEXIBLE PAVEMENT DESIGN ANALYSIS

**Project:** CSNHS-0008-00(256) **County:** Cherokee
**P.I. no.:** 0008256
**Description:** I-575 full depth section from SR 92 to Sixes Road

**Traffic Data** (NOTE: AADTs are one-way)
24-hour Truck Percentage: 13.70%
AADT initial year of design period: 44,502 vpd (2015)
AADT final year of design period: 51,152 vpd (2035)
Mean AADT (one-way): 47,827 vpd

**Design Loading**

| Mean AADT | | LDF | | Trucks | | 18-K ESAL | | Total Daily Loads |
|---|---|---|---|---|---|---|---|---|
| 47,827 | * | 0.80 | * | 0.137 | * | 1.28 | = | 6,711 |

Total predicted design period loading = 6711 * 20 * 365 = 48,990,300

**Design Data**
Terminal Serviceability Index: 2.50
Soil Support: 2.50
Regional Factor: 2.00

**PROPOSED FLEXIBLE PAVEMENT STRUCTURE**

| Material | Thickness Inches | Thickness (mm) | Structural Coefficient | Structural Value |
|---|---|---|---|---|
| 12.5 mm PEM | 135 lb/sy | (75 kg/sm) | 0.00 | 0.00 |
| 12.5 mm SMA | 2.00 | (51) | 0.44 | 0.88 |
| 19 mm Superpave | 2.00 | (51) | 0.44 | 0.88 |
| 25 mm Superpave | 0.50 | (13) | 0.44 | 0.22 |
| | 10.50 | (267) | 0.30 | 3.15 |
| Graded Aggregate Base | 12.00 | (305) | 0.16 | 1.92 |

Required SN = 7.83 Proposed SN = 7.05

**>>> Proposed pavement is 10.0% Underdesign <<<**

**Remarks:** Willmer Engineering Inc.

**Prepared by** Paul Zhang, PE/Jim Willmer, PE January 23, 2008
**Date**

**Recommended** _____
**State Urban Design Engineer** **Date**

**Approved** _____
**State Pavement Engineer** **Date**

# FLEXIBLE PAVEMENT DESIGN ANALYSIS

**Project:** CSNHS-0008-00(256) **County:** Cobb
**P.I. no.:** 0008256
**Description:** I-575 Overlay Section from Barrett Parkway to SR 92

**Traffic Data** (NOTE: AADTs are one-way)
24-hour Truck Percentage: 13.70%
AADT initial year of design period: 44,502 vpd (2015)
AADT final year of design period: 51,152 vpd (2035)
Mean AADT (one-way): 47,827 vpd

**Design Loading**

| Mean AADT | | LDF | | Trucks | | 18-K ESAL | | Total Daily Loads |
|---|---|---|---|---|---|---|---|---|
| 47,827 | * | 0.80 | * | 0.137 | * | 1.28 | = | 6,711 |

Total predicted design period loading = 6711 * 20 * 365 = 48,990,300

**Design Data**
Terminal Serviceability Index: 2.50
Soil Support: 2.00
Regional Factor: 1.80

**PROPOSED FLEXIBLE PAVEMENT STRUCTURE**

| Material | Thickness Inches | Thickness (mm) | Structural Coefficient | Structural Value |
|---|---|---|---|---|
| | *** OVERLAY *** | | | |
| 12.5 mm PEM | 135 lb/sy | (75 kg/sm) | 0.00 | 0.00 |
| 12.5 mm SMA | 2.00 | (51) | 0.44 | 0.88 |
| | *** EXISTING PAVEMENT *** | | | |
| Asphaltic Concrete | 0.00 | () | 0.44 | 0.00 |
| Asphaltic Concrete | 15.15 | (385) | 0.30 | 4.54 |
| Graded Aggregate Base | 12.06 | (306) | 0.16 | 1.93 |

Required SN = 8.15 Proposed SN = 7.35

**>>> Proposed pavement is 9.9% Underdesign <<<**

**Remarks:** Willmer Engineering Inc.

**Prepared by** Sujit Bhowmik, PhD, PE / Jim Willmer, PE
February 18, 2008
**Date**

**Recommended** _____
**State Urban Design Engineer** **Date**

**Approved** _____
**State Pavement Engineer** **Date**

# FLEXIBLE PAVEMENT DESIGN ANALYSIS

**Project:** CSNHS-0008-00(256) **County:** Cherokee
**P.I. no.:** 0008256
**Description:** I-575 overlay section from SR 92 to Sixes Road

**Traffic Data** (NOTE: AADTs are one-way)
24-hour Truck Percentage: 13.70%
AADT initial year of design period: 44,502 vpd (2015)
AADT final year of design period: 51,152 vpd (2035)
Mean AADT (one-way): 47,827 vpd

**Design Loading**

| Mean AADT | | LDF | | Trucks | | 18-K ESAL | | Total Daily Loads |
|---|---|---|---|---|---|---|---|---|
| 47,827 | * | 0.80 | * | 0.137 | * | 1.28 | = | 6,711 |

Total predicted design period loading = 6711 * 20 * 365 = 48,990,300

**Design Data**
Terminal Serviceability Index: 2.50
Soil Support: 2.50
Regional Factor: 2.00

**PROPOSED FLEXIBLE PAVEMENT STRUCTURE**

| Material | Thickness Inches | Thickness (mm) | Structural Coefficient | Structural Value |
|---|---|---|---|---|
| | *** OVERLAY *** | | | |
| 12.5 mm PEM | 135 lb/sy | (75 kg/sm) | 0.00 | 0.00 |
| 12.5 mm SMA | 2.00 | (51) | 0.44 | 0.88 |
| 19 mm Superpave | 2.50 | (64) | 0.44 | 1.10 |
| | 0.50 | (13) | 0.30 | 0.15 |
| | *** EXISTING PAVEMENT *** | | | |
| Asphaltic Concrete | 10.93 | (278) | 0.30 | 3.28 |
| Graded Aggregate Base | 10.72 | (272) | 0.16 | 1.72 |

Required SN = 7.83 Proposed SN = 7.13

**>>> Proposed pavement is 9.0% Underdesign <<<**

**Remarks:** Willmer Engineering Inc.

**Prepared by** Paul Zhang, PE/Jim Willmer, PE January 23, 2008
**Date**

**Recommended** _____
**State Urban Design Engineer** **Date**

**Approved** _____
**State Pavement Engineer** **Date**

# RIGID PAVEMENT DESIGN ANALYSIS

## (BASED ON 1981 REVISION OF 1972 AASHTO INTERIM GUIDE FOR THE DESIGN OF RIGID PAVEMENT STRUCTURES)

**PROJECT DESCRIPTION:** I-575 Full-depth Section from Barrett Parkway to SR 92
**P.I. No.:** 0008256 **PROJECT NUMBER:** CSNHS-0008-00(256) **COUNTY:** Cobb
**LENGTH:** 5.38 miles **TYPE OF SECTION:** Full-Depth Construction
**BEGINNING OF PROJECT:** MP 0.92± **END OF PROJECT:** MP 6.3±
**TYPE OF ADJOINING PAVEMENTS:** Asphaltic Concrete

**TRAFFIC DATA:**

| | | | |
|---|---|---|---|
| **24-HOUR TRUCK PERCENTAGE:** | 13.70% | ( 5.80% **MU,** | 7.90% **SU** ) |
| **ONE-WAY AADT - BEGINNING OF DESIGN PERIOD:** | 44,502 | **VPD** | ( 2015 ) |
| **ONE-WAY AADT - END OF DESIGN PERIOD:** | 51,152 | **VPD** | ( 2035 ) |
| **ONE-WAY MEAN AADT:** | 47,827 | **VPD** | |

**DESIGN LOADING:**

**DESIGN LANE TRAFFIC**

| MEAN AADT | | LDF | | TRUCKS | | 18K ESAL FACTOR | | MEAN DAILY 18K ESAL |
|---|---|---|---|---|---|---|---|---|
| 47,827 | X | 0.80 | X | 5.80% MU | X | 2.68 | = | 5,947 |
| 47,827 | X | 0.80 | X | 7.90% SU | X | 0.50 | = | 1,511 |
| 47,827 | X | 0.80 | X | 86.3% Other | X | 0.004 | = | 132 |
| | | | | | **TOTAL DAILY LOADING** | | = | 7,591 |

**TOTAL DESIGN PERIOD LOADING (ESAL)** = 7,591 loads/day **X** 20 years **X** 365 days/year = 55,412,806 **loads**

**DESIGN DATA:**

| | | | |
|---|---|---|---|
| **TERMINAL SERVICEABILITY (Pt)** | = | 2.5 | |
| **SOIL SUPPORT VALUE** | = | 2 | |
| **MODULUS OF SUBGRADE REACTION ($k_1$)** | = | 110 pci | |
| **MODULUS OF SUBGRADE REACTION ($k_2$) ABOVE GAB** | = | 224 pci | on 12 inches GAB |
| **MODULUS OF SUBGRADE REACTION ($k_{eff}$) ABOVE AC** | = | 238 pci | on 3 inches AC |
| **28-DAY CONCRETE ELASTIC MODULUS (E)** | = | 3,200,000 | psi |
| **ALLOWABLE WORKING STRESS IN CONCRETE ($f_t$)** | = | 450 psi | |
| **THICKNESS OF CONCRETE PAVEMENT REQUIRED (D)** | = | 13.2 inches | **OK** |

**(USING AASHTO INTERIM GUIDE-RIGID PAVEMENT DESIGN EQUATION - SEE BELOW**

$$\log(ESAL) = 7.35 \cdot \log(D+1) - 0.06 - \frac{0.1761}{1+\frac{1.624\times10^{7}}{(D+1)^{8.46}}} + 3.42 \cdot \log\left[\frac{f_t}{690}\cdot(D^{0.75}-1.132)/\{D^{0.75}-18.42/(E/k_{eff})^{0.25}\}\right]$$

| | | | |
|---|---|---|---|
| **USE CONCRETE PAVEMENT THICKNESS** | = | 12 inches | |
| **ACTUAL STRESS IN CONCRETE** | = | 534 psi | |
| **PERCENT OVER/UNDER DESIGNED** | = | -15.8 % | underdesigned |
| **PERCENT OVER/UNDER STRESSED** | = | 18.7 % | overstressed |

**RECOMMENDED RIGID PAVEMENT STRUCTURE:**

12 inches of Portland Cement Concrete
3 inches of Asphaltic Concrete (AC) Base
12 inches of Graded Aggregate Base (GAB)

**REMARKS:** The above recommended design is in accordance with GDOT's standard practice. This design and the percent underdesign/overstressing was discussed with GDOT-OMR.

**PREPARED BY:** Willmer Engineering: Sujit K. Bhowmik, PhD, PE / Jim Willmer, PE — 3/4/2008 DATE

**RECOMMENDED:** _____ STATE ROAD AND AIRPORT DESIGN ENGINEER — DATE

**APPROVED:** _____ STATE PAVEMENT ENGINEER — DATE

# RIGID PAVEMENT DESIGN ANALYSIS

## (BASED ON 1981 REVISION OF 1972 AASHTO INTERIM GUIDE FOR THE DESIGN OF RIGID PAVEMENT STRUCTURES)

**PROJECT DESCRIPTION:** I-575 Full-depth Section from SR 92 to Sixes Road
**P.I. No.:** 0008256 **PROJECT NUMBER:** CSNHS-0008-00(256) **COUNTY:** Cherokee
**LENGTH:** 5.05 miles **TYPE OF SECTION:** Full-Depth Construction
**BEGINNING OF PROJECT:** MP 6.3± **END OF PROJECT:** MP 11.35±
**TYPE OF ADJOINING PAVEMENTS:** Asphaltic Concrete

**TRAFFIC DATA:**

| | | | | |
|---|---|---|---|---|
| **24-HOUR TRUCK PERCENTAGE:** | 13.70% | ( 5.80% **MU,** | 7.90% **SU** ) | |
| **ONE-WAY AADT - BEGINNING OF DESIGN PERIOD:** | | 44,502 | **VPD** | ( 2015 ) |
| **ONE-WAY AADT - END OF DESIGN PERIOD:** | | 51,152 | **VPD** | ( 2035 ) |
| **ONE-WAY MEAN AADT:** | | 47,827 | **VPD** | |

**DESIGN LOADING:**

**DESIGN LANE TRAFFIC**

| MEAN AADT | | LDF | | TRUCKS | | 18K ESAL FACTOR | | MEAN DAILY 18K ESAL |
|---|---|---|---|---|---|---|---|---|
| 47,827 | X | 0.80 | X | 5.80% MU | X | 2.68 | = | 5,947 |
| 47,827 | X | 0.80 | X | 7.90% SU | X | 0.50 | = | 1,511 |
| 47,827 | X | 0.80 | X | 86.3% Other | X | 0.004 | = | 132 |
| | | | | | **TOTAL DAILY LOADING** | | = | 7,591 |

**TOTAL DESIGN PERIOD LOADING (ESAL)** = 7,591 loads/day **X** 20 years **X** 365 days/year = 55,412,806 **loads**

**DESIGN DATA:**

| | | | |
|---|---|---|---|
| **TERMINAL SERVICEABILITY (Pt)** | = | 2.5 | |
| **SOIL SUPPORT VALUE** | = | 2.5 | |
| **MODULUS OF SUBGRADE REACTION ($k_1$)** | = | 130 pci | |
| **MODULUS OF SUBGRADE REACTION ($k_2$) ABOVE GAB** | = | 244 pci | on 12 inches GAB |
| **MODULUS OF SUBGRADE REACTION ($k_{eff}$) ABOVE AC** | = | 257 pci | on 3 inches AC |
| **28-DAY CONCRETE ELASTIC MODULUS (E)** | = | 3,200,000 | psi |
| **ALLOWABLE WORKING STRESS IN CONCRETE ($f_t$)** | = | 450 psi | |
| **THICKNESS OF CONCRETE PAVEMENT REQUIRED (D)** | = | 13.2 inches | **OK** |

**(USING AASHTO INTERIM GUIDE-RIGID PAVEMENT DESIGN EQUATION - SEE BELOW**

$$\log(ESAL) = 7.35 \cdot \log(D+1) - 0.06 - \frac{0.1761}{1+\frac{1.624\times10^{7}}{(D+1)^{8.46}}} + 3.42 \cdot \log[\frac{f_t}{690} \cdot (D^{0.75}-1.132)/\{D^{0.75}-18.42/(E/k_{eff})^{0.25}\}]$$

| | | | |
|---|---|---|---|
| **USE CONCRETE PAVEMENT THICKNESS** | = | 12 inches | |
| **ACTUAL STRESS IN CONCRETE** | = | 530 psi | |
| **PERCENT OVER/UNDER DESIGNED** | = | -15.2 % | underdesigned |
| **PERCENT OVER/UNDER STRESSED** | = | 17.9 % | overstressed |

**RECOMMENDED RIGID PAVEMENT STRUCTURE:**

12 inches of Portland Cement Concrete
3 inches of Asphaltic Concrete (AC) Base
12 inches of Graded Aggregate Base (GAB)

**REMARKS:** The above recommended design is in accordance with GDOT's standard practice. This design and the percent underdesign/overstressing was discussed with GDOT-OMR.

**PREPARED BY:** Willmer Engineering: Sujit K. Bhowmik, PhD, PE / Jim Willmer, PE — 3/4/2008 DATE

**RECOMMENDED:** _____ STATE ROAD AND AIRPORT DESIGN ENGINEER — DATE

**APPROVED:** _____ STATE PAVEMENT ENGINEER — DATE

## LCCA Analyses and Results

Life-Cycle Cost Analysis (LCCA) was performed in general accordance with the guidelines in the GDOT Pavement Design Manual and the Federal Highway Administration (FHWA) Interim Technical Bulletin titled *Life-Cycle Cost Analysis in Pavement Design – In Search of Better Investment Decisions*, dated September 1998. The FHWA's life-cycle cost analysis software RealCost-Version 2.2 was used to perform the LCCA. The analysis compares the relative costs of asphaltic concrete pavement and continuously reinforced concrete pavement (CRCP). In accordance with FHWA guidelines, not all costs associated with each option are included in this analysis; only costs that demonstrate the differences between the two pavement options are included. In this analysis, it was assumed that there will be no impact on traffic during the initial construction of the roadway. Although the asphaltic concrete thickness for the Cobb County segment is one inch greater than the Cherokee County segment, this difference does not yield enough cost difference to impact the pavement choice for this project. Asphalt pavement costs for the Cobb County segment was used in the LCCA. The results of the analyses are presented in a tabular form and also graphically on Page 10 of the attached output from RealCost. All costs are for one lane-mile of the roadway.

## Sensitivity Analyses

Sensitivity analyses were performed to determine the effects for discount rate, work hours for rehabilitation activities, and work zone speed limit on the net present values (NPV) for the two pavement options. The results (NPV for one lane-mile) are presented in the following tables.

**Table A-IV-1: Effect of Discount Rate on Net Present Value**

| Discount Rate (%) | Net Present Value ($1000) | | | |
|---|---|---|---|---|
| | Asphaltic Concrete Pavement | | CRCP | |
| | Agency Cost | User Cost | Agency Cost | User Cost |
| 3 | $790.15 | $3.83 | $657.15 | $0.61 |
| 4 | $758.47 | $3.28 | $653.85 | $0.52 |
| 5 | $732.07 | $2.82 | $650.92 | $0.43 |

**Table A-IV-2: Effect of Work Hours on Net Present Value**

| Work Hours | Net Present Value ($1000) | | | |
|---|---|---|---|---|
| | Asphaltic Concrete Pavement | | CRCP | |
| | Agency Cost | User Cost | Agency Cost | User Cost |
| 9:00 PM to 5:00 AM | $758.47 | $3.28 | $653.85 | $0.52 |
| 9:00 AM to 3:00 PM | $758.47 | $330.51 | $653.85 | $51.69 |

**Table A-IV-3: Effect of Work Zone Speed Limit on Net Present Value**

| Work Zone Speed Limit (miles/hour) | Net Present Value ($1000) | | | |
|---|---|---|---|---|
| | Asphaltic Concrete Pavement | | CRCP | |
| | Agency Cost | User Cost | Agency Cost | User Cost |
| 60 | $758.47 | $3.28 | $653.85 | $0.52 |
| 55 | $758.47 | $5.13 | $653.85 | $0.81 |
| 50 | $758.47 | $6.94 | $653.85 | $1.10 |
| 45 | $758.47 | $8.86 | $653.85 | $1.40 |

As shown in Tables A-IV-1 through A-IV-3, the NPV of both agency costs and user costs are greater for asphaltic concrete pavement than CRCP for all cases.

**RealCost Input Data**

| 1. Economic Variables | |
|---|---|
| Value of Time for Passenger Cars ($/hour) | $16.04 |
| Value of Time for Single Unit Trucks ($/hour) | $25.68 |
| Value of Time for Combination Trucks ($/hour) | $30.90 |

| 2. Analysis Options | |
|---|---|
| Include User Costs in Analysis | Yes |
| Include User Cost Remaining Service Life Value | Yes |
| Use Differential User Costs | Yes |
| User Cost Computation Method | Calculated |
| Include Agency Cost Remaining Service Life Value | Yes |
| Traffic Direction | Inbound |
| Analysis Period (Years) | 35 |
| Beginning of Analysis Period | 2015 |
| Discount Rate (%) | 4.0 |

| 3. Project Details and Quantity Calculations | |
|---|---|
| State Route | I-575 |
| Project Name | I-575 Widening from Barrett Parkway to Sixes Road |
| Region | GDOT Districts 6 and 7 |
| County | Cobb,abd Cherokee |
| Analyzed By | Sujit Bhowmik - Willmer Engineering |
| Mileposts | |
| Begin | 0.92 |
| End | 11.35 |
| Length of Project (miles) | 10.43 |
| Comments | This LCCA compares the relative costs of the designed flexible (asphaltic concrete) and rigid (CRCP) pavements. |

| 4. Traffic Data | |
|---|---|
| AADT Construction Year (total for both directions) | 89,004 |
| Cars as Percentage of AADT (%) | 86.3 |
| Single Unit Trucks as Percentage of AADT (%) | 7.9 |
| Combination Trucks as Percentage of AADT (%) | 5.8 |
| Annual Growth Rate of Traffic (%) | 0.7 |
| Speed Limit Under Normal Operating Conditions (mph) | 70 |
| No of Lanes in Each Direction During Normal Conditions | 3 |
| Free Flow Capacity (vphpl) | 2059 |
| Rural or Urban Hourly Traffic Distribution | Urban |
| Queue Dissipation Capacity (vphpl) | 1800 |
| Maximum AADT (total for both directions) | 250,000 |
| Maximum Queue Length (miles) | 1.0 |

**Alternative 1**

| Initial Construction | Full-depth Construction | |
|---|---|---|
| Agency Construction Cost ($1000) | $568.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 30 | |
| No of Lanes Open in Each Direction During Work Zone | 2 | |
| Activity Service Life (years) | 10.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 70 | |
| Work Zone Capacity (vphpl) | 2059 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #1 | Asphaltic Concrete - Rehab # 1 | |
|---|---|---|
| Agency Construction Cost ($1000) | $145.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 4 | |
| No of Lanes Open in Each Direction During Work Zone | 1 | |
| Activity Service Life (years) | 10.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 60 | |
| Work Zone Capacity (vphpl) | 1800 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | 21 | 24 |
| Second period of lane closure | 0 | 5 |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #2 | Asphaltic Concrete - Rehab # 2 | |
|---|---|---|
| Agency Construction Cost ($1000) | $145.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 4 | |
| No of Lanes Open in Each Direction During Work Zone | 1 | |
| Activity Service Life (years) | 10.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 60 | |
| Work Zone Capacity (vphpl) | 1800 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | 21 | 24 |
| Second period of lane closure | 0 | 5 |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #3 | Asphaltic Concrete - Rehab # 3 | |
|---|---|---|
| Agency Construction Cost ($1000) | $145.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 4 | |
| No of Lanes Open in Each Direction During Work Zone | 1 | |
| Activity Service Life (years) | 10.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 60 | |
| Work Zone Capacity (vphpl) | 1800 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | 21 | 24 |
| Second period of lane closure | 0 | 5 |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #4 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #5 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| | | |
|---|---|---|
| **Rehabilitation #6** | | |
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

**Alternative 2**

| Initial Construction | CRCP - Initial Construction | |
|---|---|---|
| Agency Construction Cost ($1000) | $636.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 30 | |
| No of Lanes Open in Each Direction During Work Zone | 2 | |
| Activity Service Life (years) | 25.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 70 | |
| Work Zone Capacity (vphpl) | 2059 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #1 | CRCP - Rehab # 1 | |
|---|---|---|
| Agency Construction Cost ($1000) | $80.00 | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | 3.5 | |
| No of Lanes Open in Each Direction During Work Zone | 1 | |
| Activity Service Life (years) | 25.0 | |
| Maintenance Frequency (years) | 0 | |
| Agency Maintenance Cost ($1000) | 0 | |
| Work Zone Length (miles) | 1.00 | |
| Work Zone Speed Limit (mph) | 60 | |
| Work Zone Capacity (vphpl) | 1800 | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | 21 | 0:00 |
| Second period of lane closure | 0 | 5 |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #2 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #3 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #4 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| Rehabilitation #5 | | |
|---|---|---|
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

| | | |
|---|---|---|
| **Rehabilitation #6** | | |
| Agency Construction Cost ($1000) | | |
| User Work Zone Costs ($1000) | | |
| Work Zone Duration (days) | | |
| No of Lanes Open in Each Direction During Work Zone | | |
| Activity Service Life (years) | | |
| Maintenance Frequency (years) | | |
| Agency Maintenance Cost ($1000) | | |
| Work Zone Length (miles) | | |
| Work Zone Speed Limit (mph) | | |
| Work Zone Capacity (vphpl) | | |
| Time of Day of Lane Closures (use whole numbers based on a 24-hour clock) | | |
| Inbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |
| | | |
| Outbound | Start | End |
| First period of lane closure | | |
| Second period of lane closure | | |
| Third period of lane closure | | |

**Deterministic Results**

| Total Cost | Alternative 1: Flexible Pavement - Asphaltic Concrete | | Alternative 2: Rigid Pavement - Continuously Reinforced Concrete Pavement (CRCP) | |
|---|---|---|---|---|
| | Agency Cost ($1000) | User Cost ($1000) | Agency Cost ($1000) | User Cost ($1000) |
| Undiscounted Sum | $930.50 | $6.32 | $668.00 | $0.93 |
| Present Value | $758.47 | $3.28 | $653.85 | $0.52 |
| EUAC | $40.64 | $0.18 | $35.03 | $0.03 |