

RE: Report of
Geotechnical Engineering Investigation
INDOT Project No. STP-9969
DES No. 0100667 Road Replacement
East Pearl Street from Park Avenue to
Coonhunter Road (Co. Rd. 300E)
Batesville, Indiana
Ripley County
Seymour District
Patriot Project No. 1-03-0557

Prepared For:

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October 10, 2003



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East Pearl Street – from Park Avenue to
Coonhunter Road
Batesville, Indiana
Ripley County
Seymour District


Patriot Project No. 1-03-0557

Dear Ben:

Attached is the report of our subsurface investigation for the above referenced project. This report includes detailed boring logs of fourteen (14) test borings drilled on East Pearl Street from Station 11+00 to Station 53+00 in Batesville, Indiana, plus four (4) additional test borings on Line B for a proposed storm sewer. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and geotechnical recommendations pertinent to the site development and construction.

We appreciate the opportunity to have performed this geotechnical engineering investigation and are looking forward to working with you during the construction phase of the project. If you have any questions regarding this report or if we may be of any additional assistance regarding any geotechnical aspect of the project, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.


Richard L. Johnson, P.E.
Senior Project Engineer



William D. Dubois, P.E.
President



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SUMMARY OF RECOMMENDATIONS
Geotechnical Investigation
Des No.: 0100667 Project No.: STP-9969 ()
Road Replacement -East Pearl Street
Ripley County, Batesville, Indiana
Seymour District
Patriot Project No. 1-03-0557

Roadway and Pavement

In general, medium stiff to very stiff fine-grained soils were encountered in the roadway borings. Over most of the alignment the upper three feet of soil is also medium stiff to stiff. The natural moisture content of the fine-grained soils in the upper three feet of soil ranged from 17 to 22 percent, averaging 18 percent at the road boring locations. These moisture contents are approximately 3 to 8 percent above optimum, averaging about 4 percent over optimum. Medium dense sandy loam fill was noted in the upper three feet in three of the borings with moisture contents of 15 to 22 percent.

The grade of the majority of the project will not be significantly changed. The Average Annual Daily Traffic (AADT) for East Pearl Street is greater than 2,000 vehicles per day (vpd) for year 2000 and is projected to 6,620 vpd by 2020. Because the total subgrade area is greater than 10,000 square yards, **Type A** Subgrade Treatment is recommended. A CBR value of 3 could be used for pavement design.

We recommend longitudinal subsurface drains due to the low permeability of the on-site soil. The subsurface drains should be constructed in accordance with the procedures outlined in Section 718, "Underdrains", of the State Specifications. Since the subgrade soil is primarily clay loam, a geotextile filter fabric shall be utilized in accordance with INDOT Standard Specifications (ISS) 718.04.

Structures

The subgrade conditions at the invert elevations of the storm sewers evaluated during this investigation are suitable for placement of the structures. Some local undercutting of soft soils may be necessary. Proposed invert elevations extend up to 3 feet below the limestone bedrock at 2 locations for the storm sewer along East Pearl Street and up to 5 feet below the limestone bedrock or auger refusal depth for the Line B Storm Sewer. In addition, groundwater may be encountered during construction near the invert elevation. Temporary dewatering methods are recommended herein for these structures.

***This summary is a brief synopsis of our geotechnical recommendations. This summary is not intended to be used for design or construction purposes. We recommend that the designer and contractors read the entire geotechnical engineering investigation report for complete recommendations.**

REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

Geotechnical Investigation

Des No.: 0100667 Project No.: STP-9969 ()

Road Replacement – East Pearl Street from

North Park Avenue to Coonhunter Road

Ripley County, Batesville, Indiana

Seymour District

Patriot Project No. 1-03-0557

1.0 INTRODUCTION

1.1 General

The proposed project involves the replacement of a segment of East Pearl Street from North Park Avenue easterly to Coonhunter Road (Co. Rd. 300E) in Batesville, Indiana. The new roadway will be 24 feet wide (two 12-foot wide lanes), and a new storm sewer will be constructed.

The results of the geotechnical engineering investigation for this project are presented in this report. This investigation was carried out in general accordance with INDOT's standard procedures.

1.2 Purpose and Scope

The purpose of this investigation is to determine the general near surface and subsurface conditions within the project area and to develop the geotechnical engineering recommendations necessary for design and construction of the storm sewers and roadway replacement. This was achieved by drilling test borings at sixteen (16) locations plus two additional hand auger holes for a proposed retaining wall on the south side of East Pearl Street. This report contains the results of our findings, an engineering interpretation of these results with respect to the available project characteristics, and recommendations to aid in the design and construction of the storm sewers and road replacement.

2.0 PROJECT INFORMATION

The proposed project includes the replacement of a segment of East Pearl Street located in Batesville, Indiana. The western terminus is the intersection of East Pearl Street and Park Avenue (Station 10 + 95). The eastern terminus is at the intersection of Coonhunter Road (Station 53 + 00). The project length is approximately 4,205 lineal

feet, (0.80 miles). We understand a new sewer is proposed along most of the project's length (from about Station 11 + 07 to 51 + 70 except for a 199 foot long segment between Station 37 + 09 to 39 + 10). A Vicinity and Boring Location Map are presented in Appendix A.

3.0 INVESTIGATIONAL PROCEDURES

3.1 Field Work

A total of eighteen (18) test borings were performed at the project site at the approximate locations as shown on the Boring Location Map (in Appendix A).

On June 25 to June 27, 2003, Roadway Borings RB-1 through RB- 8 were drilled on East Pearl Street to a depth of 10 to 20.5 feet below the existing ground surface in accordance with INDOT Exhibit "C" (Requirements For Geotechnical Investigation and Pavement Investigation) Section D-4-B. The borings were advanced using 3¼-inch I.D. hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique (SPT) in accordance with (AASHTO T206). A 2-inch O.D. by 1³/₈ inch I.D. split-spoon sampler was driven a total of 18 inches with the number of blows of a 140-pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the N-value (or blow-count). The splitspoon samples were typically recovered at 2.5 feet intervals, beginning at a depth of 1 foot below the existing surface grades, extending until boring termination. A rock core sample was obtained from the auger refusal depth of 10.5 feet in RB-3 to the termination depth of 20.5 feet. The core sample was obtained using a standard double tube NX core barrel with a diamond cutting bit. Water levels were monitored at each borehole location during drilling and upon completion.

Four (4) additional Roadway Borings (RB-13 through RB-16) were obtained from side roads near the intersection with East Pearl Street. Borings RB-14 through RB-16 were extended to a depth of 10 feet using the same soil drilling procedures detailed in the previous paragraph. Boring RB-13 on Line S-3-A was extended to auger refusal at 18.1 feet, and a rock core sample was taken from 18.5 to 28.5 feet.

Four (4) additional borings (RB-9 through RB-12) were taken for the Line B storm sewer that will be constructed from Eastern Avenue to Tekulve Avenue. These borings were extended from 8.4 feet to 19 feet. Rock core samples were taken from 9.0 to 19.0 feet in

RB-10 and from 10.8 to 19.0 feet in RB-11. Again, the same soil drilling and coring procedures were used for these borings.

Two borings were also attempted using hand auger equipment for the proposed retaining wall (RB-17 and RB-18). These borings met refusal at depths of 10 and 8 inches, respectively, and the borings were terminated at those depths without any sampling.

Upon completion of the boring program, all of the samples retrieved in this sampling program were returned to *Patriot's* soil testing laboratory where they were visually examined and placed in groups of like material. A laboratory-generated log of each boring has been prepared based upon the driller's field log, laboratory test results, and visual classification. Test boring logs and a field classification system for soil exploration is included, in Appendix A, in this report. Indicated on each log is the primary strata encountered, the depth of each stratum change, the depth of sample, Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

3.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis included: natural moisture content determinations (AASHTO T265); Grain Size Analysis (AASHTO T88); Atterberg Limits (AASHTO T89 and T90), Unconfined Compressive Strength (AASHTO T208), Standard Proctor Test (AASHTO T99), California Bearing Ratio Test (AASHTO T193), Soil pH, and an estimate of the unconfined compressive strength (Q_u) of the cohesive soil samples utilizing a calibrated hand penetrometer. Subgrade Resilient Modulus Testing (AASHTO T 307-99) was performed on the same sample that was used for the California Bearing Ratio test. The Resilient Modulus Tests was performed by Boudreau Engineering in Suwanee, Georgia. The results of all laboratory tests are summarized in Appendix B. Soil descriptions on the boring logs are in general accordance with the AASHTO system and the INDOT Standard Specifications (ISS¹) (textural classification, e.g., clay loam).

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site Conditions

The project site is located Batesville, Indiana. *Patriot* visited the site on June 19, 2003, prior to drilling, to stake boring locations and to make visual observations regarding the site.

The project site is currently a two-lane road surrounded by industrial facilities and commercial businesses. Bonar Group provided a site plan and profile. The existing road is generally level.

4.2 Subsurface Conditions

Our interpretation of the subsurface conditions is based upon eighteen (18) widely spaced test borings, drilled at the approximate locations shown on the Boring Location Map in Appendix A. The following discussion is general; for more specific information, please refer to the boring logs presented in Appendix A. It should be noted that the dashed stratification lines shown on the soil boring logs indicate approximate transitions between soil types. In situ stratification changes could occur gradually or at different depths. All depths discussed below refer to depths below the existing ground surface.

All sixteen (16) of the truck borings were drilled through existing pavement. Beneath the asphalt pavement in Borings RB-1 through RB-8 where the asphalt ranged from 5 to 10 inches with an average thickness of about 6.5 inches, a layer of crushed stone was encountered ranging in thickness from 9 to 17 inches with an average of 12.25 inches. Total (asphalt plus crushed stone) pavement thickness ranged from 15 to 23 inches and averaged about 19 inches.

Over the length of the project, generally five major soil types were encountered beneath the surface material. The soil is comprised of Clay, Clay Loam, two different Loam groups, and Silty Clay Loam.

The **clay loam** (Test #2, Summary Sheet, Appendix A) was found directly below the crushed stone base course in RB-3 through 5, RB-7 and RB-8 and RB-14. It was also found beneath a layer of sandy loam/loam fill in RB-1, RB-9 and RB-16, beneath a layer of silty clay loam in RB-6 and RB-15 and beneath a layer of clay in RB-7. The thickness of the clay loam ranged from 1.5 to 12 feet and averaged 5.5 feet over the length of the

project. The consistency of the clay loam ranged from very soft to very stiff with SPT N-values ranging from 3 to 25 blows per foot (bpf) as based on INDOT blow count criteria.

The **silty clay loam** (Test #4, Summary Sheet, Appendix A), was encountered in RB-1 from 13.5 to 15 feet, in RB-2 from 3.5 to 5.0 feet, in RB-6 from below the pavement to 3.5 feet and in RB-15 from 3.5 to 6.0 feet. The thickness of the silty clay loam ranged from 1.5 to 2.5 feet. The consistency of the silty clay loam ranged from very soft to very stiff with SPT N-values ranging from 2 to 25 blows per foot (bpf) as based on INDOT blow count criteria.

The **clay** (Test #1, Summary Sheet, Appendix A) was found directly below the clay loam (Test #2) in RB-1, RB-2, RB-4 through 7 and RB-16 and below the silty clay loam (Test #4) in RB-2. The thickness of the clay ranged from 2.5 to 8.5 feet and averaged 4.7 feet over the length of the project. The consistency of the clay ranged from medium stiff to stiff with SPT N-values ranging from 7 to 12 blows per foot (bpf) as based on INDOT blow count criteria.

The **loam** (Test #3, Summary Sheet, Appendix A), where present (RB-2, 3, 7, 8, and 13) was found either below the clay loam (Test #2), below silty clay loam (Test #4) or below crushed stone fill generally below a depth of 13.5 feet and extending to limestone bedrock. An exception was noted in RB-3, where the loam layer was found from 8.5 to 13.5 feet. The thickness of the loam ranged from 1 to 5 feet and averaged 3.6 feet over the length of the project. The consistency of the loam was generally very stiff to very hard with SPT N-values ranging from 46 to more than 80 blows per foot (bpf) as based on INDOT blow count criteria. The exception was in RB-13, where the very soft loam layer was located beneath a crushed stone fill layer and an N-value of 2 bpf was noted.

The **loam** (Test #5, Summary Sheet, Appendix A), where present (RB-2), was a fill layer found below the pavement at a depth of 1.5 to 3.5 feet. The consistency of the loam was medium stiff with an SPT N-value of 7 blows per foot (bpf) as based on INDOT blow count criteria.

It should be noted that a layer of sandy loam fill was noted beneath the pavement in RB-1, 15 and 16. This sandy loam fill layer was found to be about 2 feet thick and was medium dense with SPT N-values of 11 to 28 bpf.

4.3 Groundwater Conditions

Groundwater was encountered during drilling in 4 Borings (RB-2, RB-3, RB-7 and RB-13) at depths of 9.2 to 14.5 feet below the existing ground surface. After the borings were completed and the augers were removed from the boreholes, water was measured in RB-2 at 15.8 feet while RB-7 was dry. The water level at completion of drilling RB-3 and RB-13 was obscured by water introduced into the borehole for rock coring. A 24-hour water reading of 7.0 feet was obtained from RB-2.

It should be recognized that fluctuations in the groundwater level should be expected to occur due to variations in rainfall and other environmental or physical factors at the time measurements are made. The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the construction of which was beyond the scope of this investigation.

5.0 DESIGN RECOMMENDATIONS

5.1 Basis

Our recommendations are based on data presented in this report, which include soil borings, laboratory testing and our experience with similar projects. Subsurface variations, that may not be indicated by a dispersive exploratory boring program, can exist on any site. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected. Refer to Appendix C for additional qualifications and contractual considerations.

5.2 Subgrade Considerations

In general, medium stiff to stiff soil was encountered in the roadway borings. Over most of the alignment the upper three feet of soil is also medium stiff to stiff. The natural moisture of the upper three feet of soil ranged from 17 to 22 percent and averaged 18 percent at the road boring locations. One Proctor test was performed on representative of the clay loam soil from the upper three feet. The optimum moisture for the clay loam (CBR 1 from Station 21+50) was 14.0 percent at a maximum dry density of 110 pcf. Therefore, the existing natural moisture of the upper three feet of soil is approximately 4% above

optimum, ranging from 3 to 8 percent over optimum.

Exceptions to these general soil subgrade conditions were noted in several of the roadway borings on Line PR-1 and on the side roads. Medium dense sandy loam or loam fill was found beneath the pavement in RB-1, RB-2, RB-15 and RB-16 extending to a depth of 3.5 feet at each location. This fill was black to gray in color and contained crushed stone and asphalt. STP N-values in the sandy loam were 11 to 28 bpf, and moisture contents were 15 to 21 percent. An STP N-value of 7 bpf and a moisture content of 32 percent were found in the loam layer in RB-2. Crushed stone fill was found beneath the pavement to a depth of 13.5 feet in RB-13. N-values ranged from 11 bpf down to 2 bpf in this layer.

Cut and At-Grade Sections

The grade of the majority of the project will not be significantly changed. The Average Annual Daily Traffic (AADT) for East Pearl Street is greater than 3,000 vehicles per day (vpd), through 2020. Because the total subgrade area is greater than 10,000 square yards, **Type A** Subgrade Treatment is recommended. Type A treatment for fine-grained subgrade soils involves the following options: (1) chemical soil modification of the upper 16 inches, or (2) over-excavating 12 inches and replacement with No. 53 coarse aggregate. (An alternate treatment is suggested in Appendix C to reduce the amount of over-excavation.)

A California Bearing Ratio test and Resilient Modulus tests were also performed on sample CBR-1 from RB-3. This sample represents the predominant soil type for the project. The California Bearing Ratio test yielded a CBR value of 2.9 percent at 97 percent compaction. The Resilient Modulus test yielded a M_R values ranging from 7,600 to 12,700, based on 15 cycles of testing at various combinations of Chamber Confining Pressure and Maximum Axial Stress applied to samples compacted to about 95 percent at optimum moisture content and at 2 percent over optimum.

Assuming proper subgrade preparation (see below and Section 6.0), a CBR value of 3 values is based on a sample compacted at +2 percent and a 2 psi Confining and Axial pressures.) We further recommend that the subgrade be prepared in accordance with Section 207, "Subgrade", of the INDOT Standard Specifications.

Other Considerations

Pockets of soft or wet soil may be encountered especially if poor weather conditions prevail during construction. Undercuts, if required, should be performed in general accordance with Section 203 of the INDOT Standard Specifications. Prior to placement of new fill, all existing surfaces should be stripped of vegetation and benched in accordance with Section 203 of the ISS.

If grading is performed in very favorable weather conditions, undercutting or drying may not be required. However, wet weather conditions will have deleterious effects on the clay loam, silty clay loam and clay subgrade. During wet periods, it is anticipated that the surficial soils will not pass proofrolling and would have to be dried and recompact, or it may be necessary to undercut prior to the placement of new fill or pavement section. Care should be taken during construction not to disturb or wet the subgrade soils. All deleterious materials and unsuitable soil encountered during roadway excavations should be removed and replaced with recompact suitable soil.

5.3 Longitudinal Pavement Subsurface Drains

As discussed, the near surface subgrade soils are clayey and loamy in nature with relatively high moisture conditions (3 to 8 percent over optimum). Therefore, we recommend installing longitudinal subsurface drains throughout the length of the project in conjunction with transverse subsurface drains as necessary in locally depressed areas along the pavement profile. The subsurface drains should be constructed in accordance with the procedures outlined in Section 718, "Underdrains", of the State Specifications. Since the subgrade soil is primarily clay loam and silty clay loam soil, a geotextile filter fabric shall be utilized in accordance with INDOT Standard Specifications (ISS) 718.04. Construction of subsurface drains may be difficult in these urban conditions, due to buried utilities and obstructions that could slow construction and increase the project cost. Consideration should be given to eliminating some subsurface drains, depending upon subsoil conditions, in areas where shallow buried utilities could be a significant problem.

5.4 Drainage Structures

Road borings were extended to depths ranging from 10 to 20.5 feet to provide data for the 12 to 48-inch diameter storm sewer and appurtenant manhole structures that extend through the entire length of the project. The soil near the proposed invert elevation is suitable for supporting these structures. **However, it should be noted that the proposed invert elevations at RB-3 and RB-13 (Line S-3-A) are below the depth at**

which bedrock was encountered. Therefore, the proposed invert elevation may be about 3 feet below the limestone bedrock surface at those locations.

Four (4) other borings were extended to depths of 8.4 to 19 feet to provide data for the 60-inch diameter to 5 feet by 3 feet to 29.5 square feet deformed pipe to 6 feet by 3 feet storm sewer (Line B) and appurtenant manhole structures that will extend from Eastern Avenue to Tekulve Avenue. The soil near the proposed invert elevation is suitable for supporting these structures. **However, it should be noted that the proposed invert elevation at RB-9 through RB-11 (Line B) is below the depth at which bedrock was encountered in RB-10 and RB-11 and below the auger refusal depth (and estimated bedrock surface in RB-9). Therefore, the proposed invert elevation may be about 3 to 5 feet below the limestone bedrock surface near RB-9, about 2 to 4 feet below the limestone surface at RB-10 and about 1 foot below the rock surface at RB-11.**

In addition, pH testing of 5 representative samples indicated pH values between 7.3 and 7.6, with an average of about 7.45, indicative of generally neutral soils.

Note that pockets of soft, wet or otherwise unsuitable materials may be encountered at the bearing grade and may require undercutting to achieve the above bearing capacities. Proper subgrade inspection during construction will be critical to keep settlements within tolerable limits. In addition, several of the borings indicate that water is close to or just below the invert elevation for some of the structures (see borings RB-2, 3, 7 and 13.) Temporary dewatering during construction should be expected in these areas. Dewatering recommendations are presented in Section 6.4 below.

5.5 Retaining Wall

Two low modular block retaining walls are proposed for this project. One wall extends from about Station 19+25 to 24+25 and the second from about Station 49+25 to 50+35. Both walls will be located about 20 to 22 feet right of Line "PR-1", and both will be a maximum of 3 to 3.5 feet in height. Two hand auger borings (RB-17 and RB-18) were attempted to investigate the subsurface conditions for these walls. Neither boring could be advanced beyond a depth of 10 inches. Boring RB-3 was drilled at Station 21+50, 2 feet right of "PR-1", and RB-8 was drilled at Station 50+98, 3 feet right of "PR-1". Stiff to very stiff clay loam soil was encountered from 2.5 to 4 feet below the pavement surface in RB-3 and from 2 to 3.5 feet in RB-8. Based on the resistance encountered by the hand auger borings and the stiff to very stiff clay loam soils in RB-3 and RB-8, the foundation soils are suitable for the support of these low walls for a maximum toe pressure of 2,000

pounds per square foot (psf), provided that the recommendations included in Section 6.3 of this report are followed.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

Site preparation should be performed in general compliance with Section 201 "Clearing and Grubbing" of the latest edition of the Indiana Department of Transportation (INDOT) Standard Specifications. Prior to placement of embankment fill, foundations, structure backfill, or base course materials, all topsoil and other unsuitable materials must be removed from within the embankment/pavement section. Unsuitable materials include; frozen soil, relatively soft material, old fill, relatively wet soils, deleterious material, or soils near the surface that exhibit a high organic content. Deeper undercutting may be required in localized areas such as at existing ditch lines, buried drain tiles, and culverts.

6.2 Roadway Excavation and Embankment Construction

The removal of existing structures and obstructions within the construction limits shall be performed in general compliance with Section 202 "Removal of Structures and Obstructions" of the Specifications. Backfilling of open excavations at these structures should be performed in accordance with Section 203.23 "Embankment Over and Around Structures" of the Specifications.

As a general practice, we recommend proofrolling of all exposed surfaces within the limits of proposed embankment construction to delineate local soft or disturbed areas. **As indicated in Section 5.2, the near surface had in-situ moisture contents above the optimum moisture content.** These soils may become soft during grading and require additional treatment depending on the conditions encountered during construction. General construction requirements for preparation and construction of embankment areas should be performed in compliance with all applicable parts of "Excavation and Embankment – General Construction Requirements", Section 203.09 of the Specifications.

6.3 Shallow Foundation Excavations

Upon completion of the foundation excavations and prior to the placement of reinforcing steel, the exposed subgrade should be checked to confirm that a bearing surface of adequate strength has been reached. Any localized soft soil zones encountered at the bearing elevations should be further excavated until adequate support soils are

encountered. The cavity should be backfilled with structural fill as defined below, or the footing can be poured at the excavated depth. Structural fill used as backfill beneath footings should be limited to lean concrete, well-graded sand and gravel, or crushed stone placed and compacted in accordance with Section 6.2.

If it is necessary to support spread footings on structural fill, the fill pad must extend laterally a minimum distance beyond the edge of the footing. The minimum structural pad width would correspond with a point at which an imaginary line extending downward from the outside edge of the footing at a 1H:2V slope intersects the surface of the natural soils. For example, if the depth to the bottom of excavation is 4 feet below the bottom of the foundation, the excavation would need to extend laterally beyond the edge of the footing at least 2 feet.

Excavation slopes should be maintained within OSHA requirements. In addition, we recommend that any surcharge fill or heavy equipment be kept at least 5 feet away from the edge of the excavation.

6.4 Groundwater

Groundwater was encountered during drilling in 4 borings at depths of 9.2 to 14.5 feet below the existing ground surface. After the borings were completed and the augers were removed from the boreholes, water was measured at 1 boring location (RB-2) at a depth of 15.8 feet below the existing ground surface. A 24-hour water reading was obtained from boring RB-2 at a depth of 7 feet.

Groundwater inflow into shallow excavations above the water table is expected to be adequately controlled by conventional methods such as gravity drainage and/or pumping from sumps. More significant inflow can be expected in deeper excavations below the groundwater table requiring more aggressive dewatering techniques, such as well or wellpoint systems.

7.0 LIMITATIONS OF INVESTIGATION

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. Subsurface conditions at other locations may differ from those occurring at the specific drill sites.

The nature and extent of variations between borings may not become evident until the course of construction. If variations become evident, it will be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation and noting the characteristics of any variation.

Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

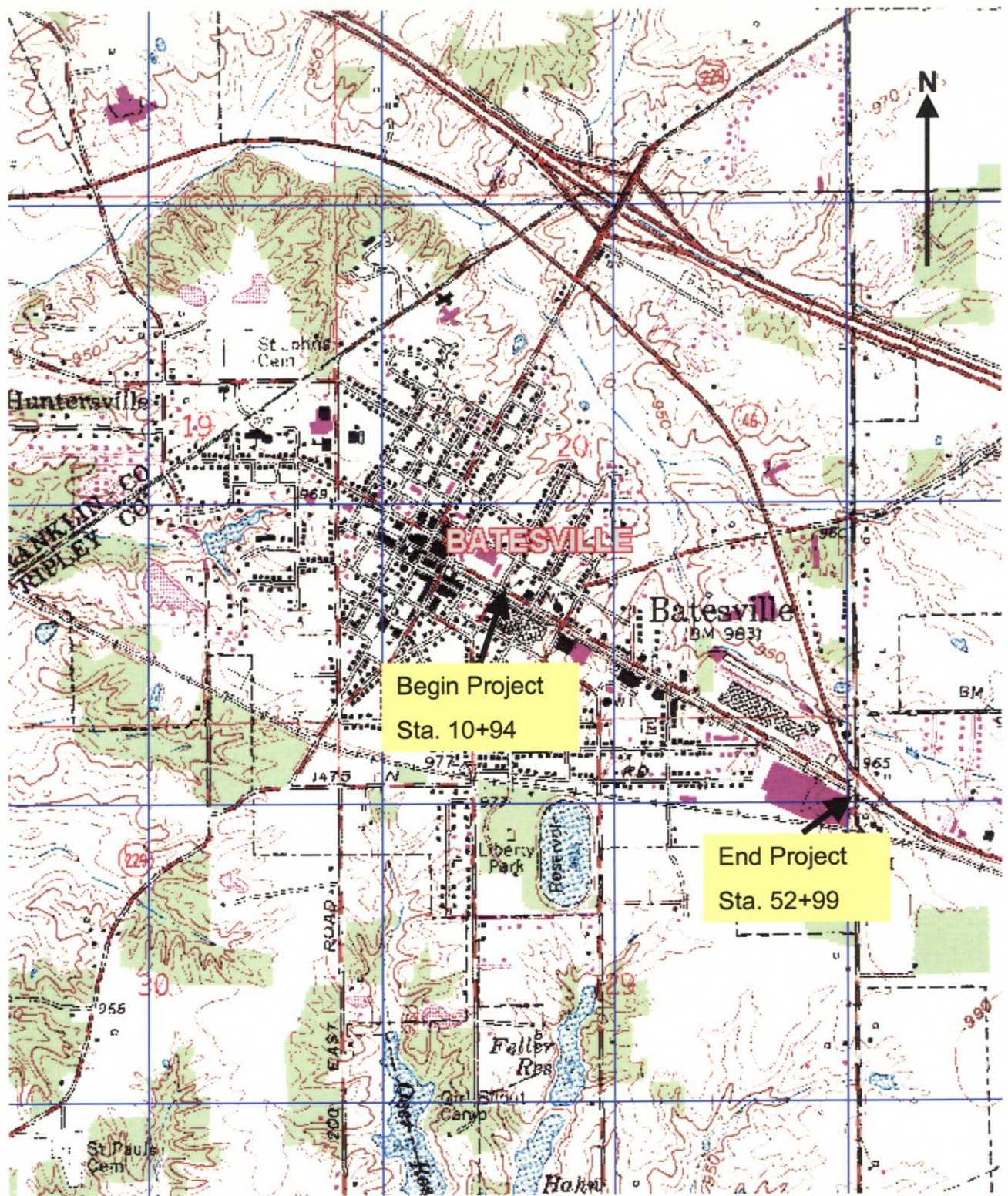
APPENDIX A

**VICINITY MAP
(Figure 1)**

**BORING LOCATION MAP
(Figure 2)**

BORING LOG KEY

BORING LOGS



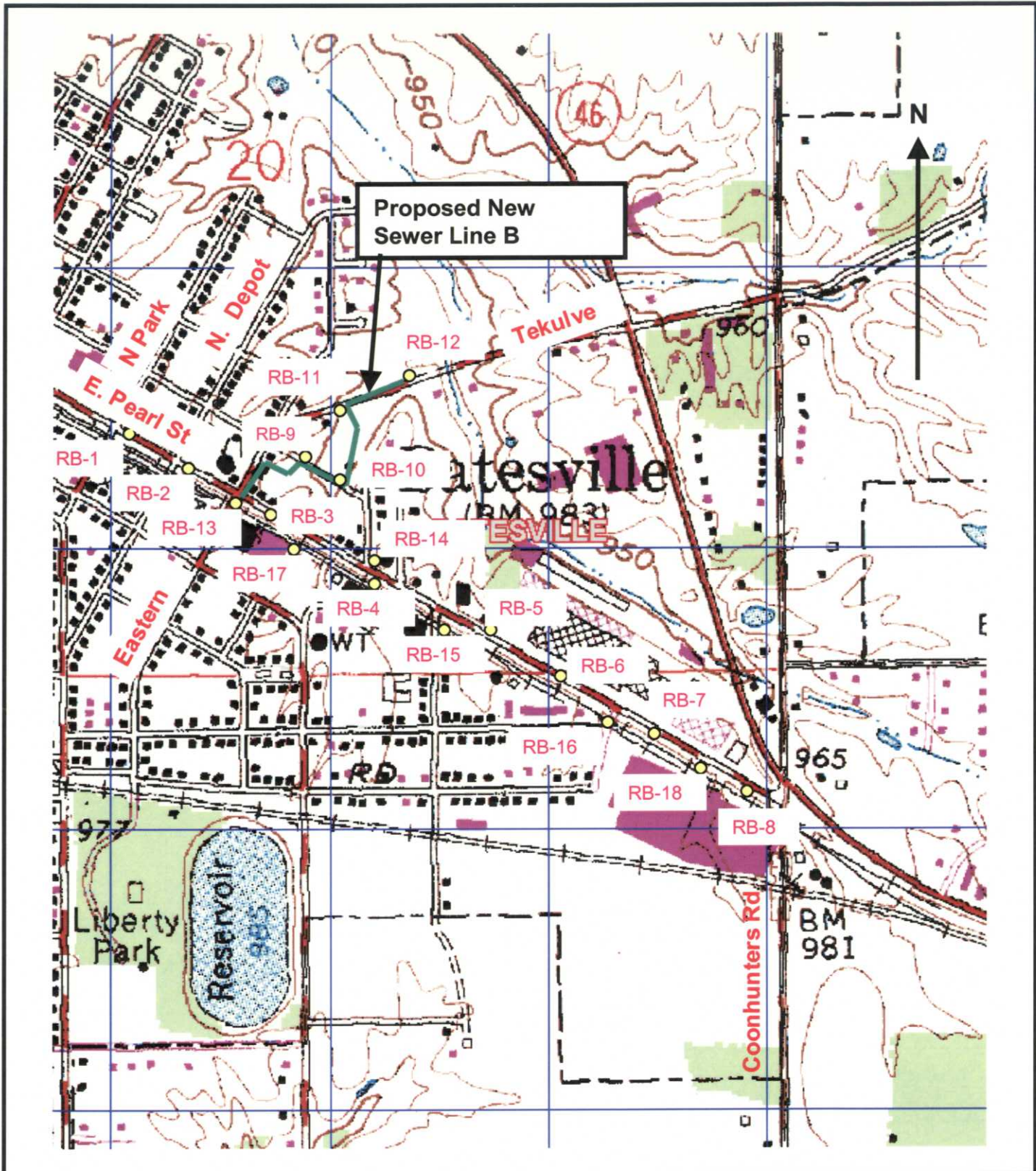
PATRIOT ENGINEERING
and Environmental, Inc.
Indianapolis, IN 46250

Site Vicinity Map

East Pearl St. Rehabilitation
Batesville, Indiana
STP 9969 (), Des No. 0100667

Job No. 1-03-0557

Figure 1



PATRIOT ENGINEERING
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Boring Location Map
East Pearl St. Rehabilitation
Batesville, Indiana
STP- 9969 (), Des No. 0100667

Job No. 1-03-0557

Figure 2

BORING LOG KEY

AASHTO FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS (Silt, Sand, Gravel and Combinations)

Density		Grain Size Terminology		
		Soil Fraction	Particle Size	US Standard Sieve Size
Very Loose	5 blows/ft. or less			
Loose	6 to 10 blows/ft.			
Medium Dense	11 to 30 blows/ft.	Boulders	Larger than 75mm	Larger than 75mm
Dense	31 to 50 blows/ft.	Gravel:	2.00mm to 75mm	#10 to 75mm
Very Dense	51 blows/ft. or more	Sand: Coarse	0.42mm to 2.00mm	#40 to #10
		Fine	0.075mm to 0.42mm	#200 to #40
		Silt	0.002mm to 0.075mm	Smaller than #200
		Clay	Smaller than 0.002mm	Smaller than #200

RELATIVE PROPORTIONS FOR SOILS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS

(Clay, Silt and Combinations)

Consistency		Field Identification	Unconfined Compressive Strength (tons/sq. ft.)
Very soft	3 blows/ft. or less	Thumb will penetrate soil more than 1 inch	Less than 0.25
Soft	4 to 5 blows/ft.	Thumb will penetrate soil about 1 inch	0.25 - 0.5
Medium Stiff	6 to 10 blows/ft.	Thumb will penetrate soil about ½ inch	0.5 - 1.0
Stiff	11 to 15 blows/ft.	Thumb will indent soil about ¼ inch	1.0 - 2.0
Very Stiff	16 to 30 blows/ft.	Readily indented by thumbnail	2.0 - 4.0
Hard	31 blows/ft. or more	Indented with difficulty by thumbnail	Over 4.0

Classification on logs are made by visual inspection.

Standard Penetration Test - Driving a 2.0" O.D., 1^{3/8}" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for **Patriot** to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.).

Strata Changes - In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (——) represents an actually observed change, a dashed line (- - - -) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Groundwater symbols: ▼-observed groundwater elevation, encountered during drilling; ∇-observed groundwater elevation upon completion of boring.



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-1

Page 1 of 1

Surface Elevation: 972.5 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 11+50 Offset: 10 feet Rt Line: A
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-61
Cave-In Depth: 9.5 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level							
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %
DESCRIPTION/CLASSIFICATION and REMARKS							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %	
0							ASPHALT (5") (Visual)							
	1	SS	78	33/14/14			CRUSHED STONE (10") (Visual)							
							Black and gray, moist, medium dense, SANDY LOAM with some crushed stone and asphalt (Fill) (Visual)				15			
	2	SS	100	4/2/2			Brown and gray, moist, soft to medium stiff, CLAY LOAM A-6 Test Number 2	0.5			25			
	3	SS	100	3/3/5				1.0			20			
	4	SS	100	3/5/5			Brown and gray, slightly moist, medium stiff, CLAY A-7-6 Test Number 1				18			
	5	SS	100	3/9/16			Brown, slightly moist, very stiff, SILTY CLAY LOAM A-6 Test Number 4	2.25			15			
Boring terminated at 15 feet.														



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-2

Page 1 of 1

Location: Batesville, Indiana
Client: Bonar Group

Surface Elevation: 970.0 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 15+50 Offset: 6 feet Rt Line: A
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-61
Cave-In Depth: 16 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS						
							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0							Water Level ▼ During Drilling (14.5 feet) ▽ After Completion (15.8 feet) ◆ After 24-Hours (7 feet)						
0							ASPHALT (5") (Visual)						
0							CRUSHED STONE (12") (Visual)						
0	1	SS	60	9/4/3			Dark gray and black, moist, medium stiff, LOAM with trace crushed stone and asphalt (Fill) (Visual)						
0	2	SS	70	2/1/1			Brown, moist, very soft, SILTY CLAY LOAM A-6 Test Number 4						
0	3	ST	58				Brown and gray, moist, stiff, CLAY A-7-6 (44) Test Number 1						
0	4	SS	85	3/5/6			2.0						
0	5	SS	40	23/25/29			Brown, slightly moist, very stiff, LOAM with trace weathered limestone A-6 Test Number 3						
0	6	SS	20	50-6"			Brown, wet, weathered, LIMESTONE fragments (Visual)						
19	Boring terminated at 19 feet.												

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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-3

Page 1 of 1

Location: Batesville, Indiana

Client: Bonar Group

Surface Elevation: 963.7 feet

Patriot Project No.: 1-03-0557

Project No.: STP 9969 ()

Station: 21+50

Offset: 2 feet Rt

Line: PR-1

Structure No.: N/A

Weather: Sunny

Temp: 90 °

Driller: R. Sumler

Des. No.: 0100667

Start Date: 6/25/03

End Date: 6/25/03

Rig: Mobile B-61

Cave-In Depth: 10 feet

Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
<p>Water Level</p> <p>▼ During Drilling (9.2 feet)</p> <p>▽ After Completion (Obscured due to rock coring.)</p> <p>◆ After 24-Hours (N/A)</p>														
0							ASPHALT (5") (Visual)							
							CRUSHED STONE (17") (Visual)							
1	1	SS	75	4/6/7			Gray to brown, slightly moist, stiff, CLAY LOAM A-6 (16) Test Number 2	2.0			22	40	14	26
5	2	SS	60	5/5/6				2.0			14			
10	3	SS	95	8/13/33			Brown, slightly moist, hard, LOAM with wet sand seam at 9.2 feet A-6 (4) Test Number 3 Auger refusal at 10.5 feet	4.5+			9	26	12	14
							Rockcore from 10.5 to 20.5 feet, RQD= 33%							
							Lt gray, slightly weathered fine to medium grained LIMESTONE with fossils and a weathered shale seam from 17 to 17.3 feet (Visual)							
15	4	RC	86											
20														
Boring terminated at 20.5 feet.														
25														
30														



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-4

Page 1 of 1

Location: Batesville, Indiana
Client: Bonar Group

Surface Elevation: 967.3 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 27+50 Offset: 3 feet Rt Line: PR-1
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-61
Cave-In Depth: 5 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level													
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (Dry)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %				
DESCRIPTION/CLASSIFICATION and REMARKS																				
0							ASPHALT (6") (Visual)													
							CRUSHED STONE (17") (Visual)													
1	1	SS	60	10/4/4			Brown and gray, slightly moist, medium stiff, CLAY LOAM A-6 Test Number 2						18							
2	2	SS	60	4/4/5				0.75					16							
3	3	SS	100	3/4/6			Gray and brown, moist, medium stiff, CLAY A-7-6 Test Number 1	1.0					22							
4	4	SS	80	3/3/4				1.0					26							
Boring terminated at 10 feet.																				



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-5

Page 1 of 1

Surface Elevation: 969.2 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 33+50 Offset: 10 feet Lt Line: PR-1
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-51
Cave-In Depth: 5.5 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level											
							During Drilling (Dry)	After Completion (Dry)	After 24-Hours (Dry)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %		
DESCRIPTION/CLASSIFICATION and REMARKS																		
0							ASPHALT (7") (Visual)											
							CRUSHED STONE (12") (Visual)											
	1	SS	70	4/8/6			Brown and gray, slightly moist, stiff, CLAY LOAM with crushed stone layer at 3 feet (Fill) A-6 Test Number 2	1.75				17						
	2	SS	80	4/5/7			Brown and gray, slightly moist, stiff, CLAY LOAM A-6 Test Number 2	1.5				16						
	3	SS	100	4/5/6			Gray and brown, moist, stiff, CLAY A-7-6 Test Number 1	1.25				24						
	4	SS	75	4/5/6				1.0				20						
10	Boring terminated at 10 feet.																	
15																		
20																		
25																		
30																		



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-6 Page 1 of 1

Surface Elevation: 970.0 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 39+50 Offset: 6 feet Lt Line: PR-1
Structure No.: N/A Weather: Cloudy Temp: 85 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/26/03 End Date: 6/26/03 Rig: Mobile B-61
Cave-In Depth: 6.8 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level												
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %			
DESCRIPTION/CLASSIFICATION and REMARKS																			
0							ASPHALT (10") (Visual)												
							CRUSHED STONE (9") (Visual)												
	1	SS	40	9/7/6			Gray and brown, slightly moist, stiff, SILTY CLAY LOAM A-6 (20) Test Number 4	1.25				17	40	16	24				
	2	SS	85	4/6/6			Brown and gray, Slightly moist, stiff, CLAY LOAM A-6 Test Number 2	2.0				13							
	3	SS	20	4/5/5			Gray, slightly moist to moist, medium stiff CLAY A-7-6 Test Number 1	1.0				19							
	4	SS	100	3/4/6				1.0				24							
10	Boring terminated at 10 feet.																		
15																			
20																			
25																			
30																			



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-7

Page 1 of 1

Surface Elevation: 970.2 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 46+13 Offset: 3 feet Rt Line: PR-1
Structure No.: N/A Weather: Cloudy Temp: 85 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/26/03 End Date: 6/26/03 Rig: Mobile B-61
Cave-In Depth: 10.5 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level								
							During Drilling (13.5 feet)	After Completion (Dry)	After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %
DESCRIPTION/CLASSIFICATION and REMARKS															
0							ASPHALT (7") (Visual)								
							CRUSHED STONE (11") (Visual)								
	1	SS	60	5/6/6			Gray and brown, slightly moist, stiff to medium stiff, CLAY LOAM A-6 Test Number 2	2.0				17			
	2	SS	90	5/4/5			Fuel odor observed at 2 feet.	1.0				18			
	3	SS	100	3/5/7			Gray and brown, slightly moist, stiff, CLAY A-7-6 Test Number 1	1.75				18			
	4	SS	100	5/6/6			Brown, moist, stiff, CLAY LOAM A-6 Test Number 2	1.5				21			
	5	SS	75	8/17/35			Brown, slightly moist, hard, LOAM A-6 Test Number 3	4.5				7			
							Boring terminated at 15 feet.								



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-8 Page 1 of 1

Location: Batesville, Indiana
Client: Bonar Group

Surface Elevation: 970.1 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 ()	Station: 50+98	Offset: 3 feet Rt	Line: PR-1
Structure No.: N/A	Weather: Cloudy	Temp: 85 °	Driller: R. Sumler
Des. No.: 0100667	Start Date: 6/26/03	End Date: 6/26/03	Rig: Mobile B-61
Cave-In Depth: 8 feet	Remarks: PR-1		

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0						ASPHALT (8") (Visual)							
						CRUSHED STONE (10") (Visual)							
	1	SS	85	3/4/7		Gray and brown, slightly moist, stiff to very stiff, CLAY LOAM A-6 Test Number 2	2.0			19			
	2	SS	20	5/5/6			2.0			15			
	3	SS	100	5/7/11			2.75			17			
	4	SS	100	6/11/14			3.25			18			
	5	SS	80	15/29/50-4"		Brown, slightly moist, hard, LOAM A-6 Test Number 3	4.5+			9			
	6	SS	10	50-3"		Gray, weathered, LIMESTONE (Visual)							
Boring terminated at 18.7 feet.													



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana

Client: Bonar Group

Boring No.: RB-9

Page 1 of 1

Surface Elevation: 954.2 feet

Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 13+73 Offset: 4 feet Rt Line: B
 Structure No.: N/A Weather: Sunny Temp: 78 ° Driller: R. Sumler
 Des. No.: 0100667 Start Date: 6/27/03 End Date: 6/27/03 Rig: Mobile B-61
 Cave-In Depth: 6 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS											
							Water Level	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %				
0							ASPHALT (5") (Visual)											
							CRUSHED STONE (7") (Visual)											
	1	SS	50	3/2/2			Dark gray to brown, moist, soft, LOAM with trace brick (Fill) A-6 Test Number 5					23						
	2	SS	80	2/3/3			Brown, slightly moist, medium stiff, CLAY LOAM A-6 Test Number 2	1.0				18						
	3	SS	90	4/9/21			Brown, slightly moist, very stiff, LOAM A-6 Test Number 3	4.0				19						
	4	SS	5	50-5"			Auger refusal at 8 feet.											
							Gray, weathered, LIMESTONE (Visual)											
							Boring terminated at 8.4 feet.											

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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-10 Page 1 of 1

Location: Batesville, Indiana
Client: Bonar Group

Surface Elevation: 951.4 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 15+74 Offset: 3 feet Lt Line: B
Structure No.: N/A Weather: Sunny Temp: 78 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/27/03 End Date: 6/27/03 Rig: Mobile B-61
Cave-In Depth: 8 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS						
							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0							ASPHALT (3") (Visual) CRUSHED STONE (7") (Visual) Dark gray and brown, moist, soft, CLAY LOAM with trace brick (Fill) A-6 Test Number 2						
1	1	SS	70	4/2/2			0.25			26			
2	2	SS	75	3/2/1			0.25			25			
3	3	SS	85	3/4/4	▼	Wet sand seam at 6.4 feet	1.0			21			
4	4	SS	5	50-2"		Brown and gray, moist, medium stiff to hard, CLAY A-7-6 Test Number 1				19			
5	5	RC				Auger Refusal at 9 feet Lt gray, weathered, fine to medium grained LIMESTONE (Visual) Dark gray, slightly weathered, fine to medium grained, LIMESTONE interbedded with weathered shale seams (Visual) Dark Gray with lt gray partings, slightly weathered fine to medium grained, LIMESTONE (Visual)							
19	Boring terminated at 19 feet.												



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-11 Page 1 of 1

Surface Elevation: 947.6 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 20+04 Offset: 10 feet Lt Line: B
Structure No.: N/A Weather: Cloudy Temp: 85 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/26/03 End Date: 6/27/03 Rig: Mobile B-61
Cave-In Depth: 8 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS						
							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0							ASPHALT (10") (Visual)						
							CRUSHED STONE (6") (Visual)						
1	1	SS	80	2/2/3			Brown, slightly moist, soft to medium stiff, CLAY LOAM A-6 Test Number 2						
2	2	SS	20	4/4/5			0.5						
3	3	SS	90	5/8/9			0.75						
4	4	SS	100	5/8/13			Brown, slightly moist, very stiff, LOAM A-6 Test Number 3						
5							4.0						
10							Auger refusal at 10.8 feet, flush with pavement, begin rockcoring on 6/27/03.						
							Rock core from 10.8 to 19.0 feet, RQD= 9%						
							Lt gray, weathered, fine to medium grained LIMESTONE interbedded with shale and clay seams (Visual)						
							Dark gray weathered SHALE interbedded with limestone (Visual)						
15	5	RC	50				4.0						
20	Boring terminated at 19 feet.												
25													
30													

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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation
Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-12 Page 1 of 1

Surface Elevation: 965.0 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 25+29 Offset: 10 feet Rt Line: B
Structure No.: N/A Weather: Sunny Temp: 78 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/27/03 End Date: 6/27/03 Rig: Mobile B-61
Cave-In Depth: 11 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level								
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %
DESCRIPTION/CLASSIFICATION and REMARKS															
0							ASPHALT (8") (Visual)								
							CRUSHED STONE (6") (Visual)								
	1	SS	80	4/5/4			Gray and brown, slightly moist, medium stiff, LOAM (Fill) A-6 (4) Test Number 5	1.0				12	28	13	15
	2	SS	90	3/3/5			Gray and brown, moist, medium stiff to stiff, CLAY LOAM A-6 Test Number 2	1.0				19			
	3	SS	100	3/4/6				1.0				20			
	4	SS	100	4/6/6				2.0				19			
	5	SS	95	7/7/9			Gray and brown, moist, very stiff, CLAY A-7-6 Test Number 1	2.25				24			
							Boring terminated at 15 feet.								



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Boring No.: RB-13 Page 1 of 1

Location: Batesville, Indiana
Client: Bonar Group

Surface Elevation: 969.2 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 9+55 Offset: 10 feet Rt Line: S-3-A
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-61
Cave-In Depth: 7 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0							Water Level ▼ During Drilling (13 feet) ▽ After Completion (Obscured due to rock coring.) ◆ After 24-Hours (N/A)													
0							ASPHALT (6") (Visual)													
0							CRUSHED STONE (Visual) (Fill)													
1	1	SS	80	8/6/5																
2	2	SS	60	5/4/4																
3	3	SS	20	2/2/2																
4	4	SS	20	2/1/1																
5																				
15	5	SS	40	1/1/1			Brown, wet, very soft, LOAM A-6 Test Number 3										33			
18.1							Auger refusal at 18.1 feet													
18.5							Rockcore from 18.5 to 28.5 feet, RQD= 48 %													
20							Lt gray, slightly weathered, fine to medium grained LIMESTONE (Visual)													
25							Dark gray weathered SHALE (Visual)													
25							Lt gray, slightly weathered, fine to medium grained LIMESTONE interbedded with shale seams (Visual)													
28.5							Boring terminated at 28.5 feet.													

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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-14 Page 1 of 1

Surface Elevation: 969.0 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 ()	Station: 10+75	Offset: 10 feet Rt	Line: S-4-A
Structure No.: N/A	Weather: Sunny	Temp: 90 °	Driller: R. Sumler
Des. No.: 0100667	Start Date: 6/25/03	End Date: 6/25/03	Rig: Mobile B-61
Cave-In Depth: 9 feet	Remarks:		

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level												
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %			
DESCRIPTION/CLASSIFICATION and REMARKS																			
0							ASPHALT (3") (Visual)												
	1	SS	100	3/4/6			CRUSHED STONE (5") (Visual)												
							Brown and gray, slightly moist, medium stiff to stiff, CLAY LOAM A-6	1.0					16						
	2	SS	80	5/4/4			Test Number 2	1.0					18						
5																			
	3	SS	100	3/4/6				1.0					19						
	4	SS	70	4/5/6				1.0					17						
10							Boring terminated at 10 feet.												
15																			
20																			
25																			
30																			



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and Lafayette

LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation
Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-15 Page 1 of 1

Surface Elevation: 970.4 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 9+50 Offset: 10 feet Rt Line: S-6-A
Structure No.: N/A Weather: Sunny Temp: 90 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/25/03 End Date: 6/25/03 Rig: Mobile B-61
Cave-In Depth: 6.7 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	Water Level							
							▼ During Drilling (Dry)	▽ After Completion (Dry)	◆ After 24-Hours (N/A)	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %
DESCRIPTION/CLASSIFICATION and REMARKS							qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %	
0							ASPHALT (6") (Visual)							
							CRUSHED STONE (12") (Visual)							
	1	SS	80	6/7/7			Black, slightly moist, medium dense, SANDY LOAM with crushed stone and asphalt (Fill) (Visual)				16			
	2	SS	70	4/3/3			Gray and brown, slightly moist, medium stiff, SILTY CLAY LOAM A-6 Test Number 4	0.75			13			
	3	SS	100	3/3/5			Gray and brown, moist, medium stiff, CLAY LOAM A-6 Test Number 2	1.0			23			
	4	SS	100	3/4/6			Fuel odor observed at 6feet	0.75			22			
10	Boring terminated at 10 feet.													
15														
20														
25														
30														



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-16 Page 1 of 1

Surface Elevation: 971.5 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 9+60 Offset: 13 feet Rt Line: S-7-A
Structure No.: N/A Weather: Cloudy Temp: 85 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/26/03 End Date: 6/26/03 Rig: Mobile B-51
Cave-In Depth: 7 feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level	GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
<p>Water Level</p> <p>▼ During Drilling (Dry)</p> <p>▽ After Completion (Dry)</p> <p>◆ After 24-Hours (N/A)</p>														
0							ASPHALT (11") (Visual)							
							CRUSHED STONE (10") (Visual)							
	1	SS	90	4/5/6			Black and gray, moist, medium dense, SANDY LOAM with crushed stone and asphalt (Fill) A-2 (Visual)				21			
	2	SS	80	2/1/2			Gray and Brown, moist, very soft, CLAY LOAM A-6	0.25			18			
	3	ST	56				Test Number 2 Gray and brown, slightly moist, medium stiff, CLAY A-7-6		1.6	110.3	18			
	4	SS	100	3/3/5			Test Number 1	1.0			20			
10	Boring terminated at 10 feet.													
15														
20														
25														
30														



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LOG OF TEST BORING

Project: East Pearl Street Road Rehabilitation

Location: Batesville, Indiana
Client: Bonar Group

Boring No.: RB-17 Page 1 of 1

Surface Elevation: 967.50 feet
Patriot Project No.: 1-03-0557

Project No.: STP 9969 () Station: 21+75 Offset: 21 feet Rt Line: "PR-1"
Structure No.: N/A Weather: Cloudy Temp: 85 ° Driller: R. Sumler
Des. No.: 0100667 Start Date: 6/26/03 End Date: 6/26/03 Rig: Mobile B-61
Cave-In Depth: NA feet Remarks:

Depth in Feet	Sample No.	Sample Type	Rec %	SPT Results	Water Level GRAPHIC	DESCRIPTION/CLASSIFICATION and REMARKS	qp tsf	qu tsf	Dry Unit Wt.	w %	LL %	PL %	PI %
0	1	HA			Water Level ▼ During Drilling (Dry) ▽ After Completion (Dry) ◆ After 24-Hours (N/A)	TOPSOIL(2") (Visual) Brown, slightly moist, LOAM (Fill) (Visual) Hand auger refusal at 10 inches. Offset hand auger boring; however, unable to advance the hand auger.							
5													
10													
15													
20													
25													
30													

APPENDIX B

Summary of Classification Test Data

Particle Size Distribution Reports

Unconfined Compressive Strength Test Curves (Qu)

Standard Proctor Test Curve

CBR Test Curve

Summary of CBR Test Data

Resilient Modulus Test Data

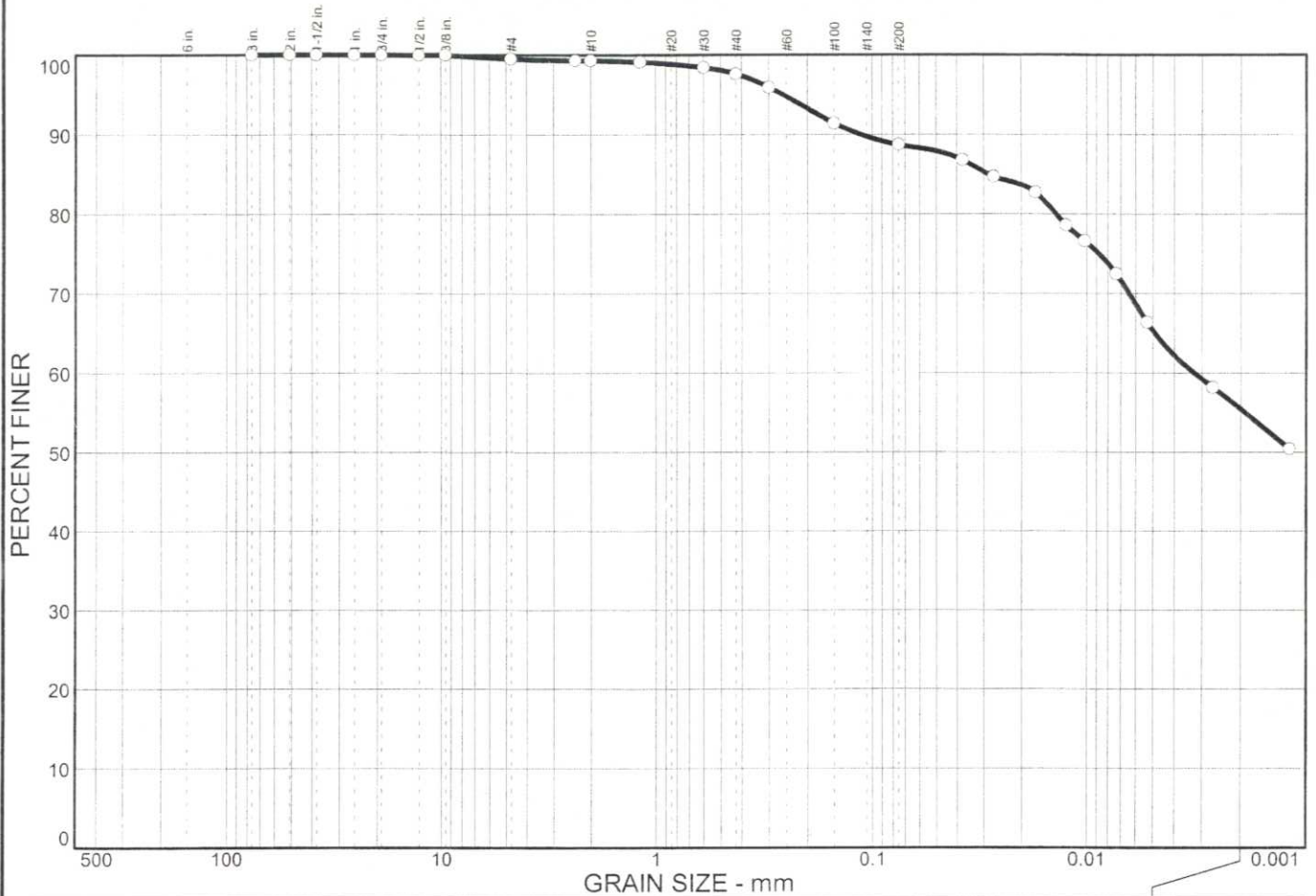
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SUMMARY OF CLASSIFICATION TESTS DATA

Project Name: East Pearl Street Road Rehabilitation, Batesville, Indiana INDOT Project Number: STP-9969 (), DES# 0100667
 Structure No.: N/A County: Ripley
 District: Seymour
 Patriot Proj. No.: 1-03-0557 Client: Bonar Group
 Client Address: 6420 Castleway West Drive, Indianapolis, IN 46250

Test Number	Boring Number	Station	Offset	Sample Number	Sample Depth ft.	Classification	% Passing			% Sand	% Silt	% Clay	pH	LL	PL	PI	
							#10	#40	#200								
1	RB-2	15+50	6 ft. Rt. "A"	S-4	8.5-10	Textural CLAY	AASHTO A-7-6(44)	99.3	97.6	88.7	10.6	33.3	55.4	7.3	66	20	46
2	RB-3	21+50	2 ft. Rt. "PR-1"	CBR-1	2-6	CLAY LOAM	A-6(16)	95.9	89.2	71.1	24.8	42.1	29.0	7.6	40	14	26
3	RB-3	21+50	2 ft. Rt. "PR-1"	S-3	8.5-10	LOAM	A-6(4)	91.6	81.0	52.5	39.1	37.5	15.0	7.5	26	12	14
4	RB-6	39+50	6 ft. Lt. "PR-1"	S-1	2-3.5	SILTY CLAY LOAM	A-6(20)	97.6	94.7	86.6	11.0	60.8	25.8	7.4	40	16	24
5	RB-12	25+29	10 ft. Rt. "B"	S-1	1.5-3	LOAM	A-6(4)	84.8	78.7	53.0	31.8	36.6	16.4	7.5	28	13	15

Particle Size Distribution Report



% +75 MM	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	10.6	33.3	55.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1 -1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	99.5		
#8	99.3		
#10	99.3		
#16	99.1		
#30	98.4		
#40	97.6		
#50	95.9		
#100	91.4		
#200	88.7		

Soil Description

Brown and gray, CLAY, pH = 7.3

Atterberg Limits

PL= 20 LL= 66 PI= 46

Coefficients

D₈₅= 0.0285 D₆₀= 0.0033 D₅₀=
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO= A-7-6(44)

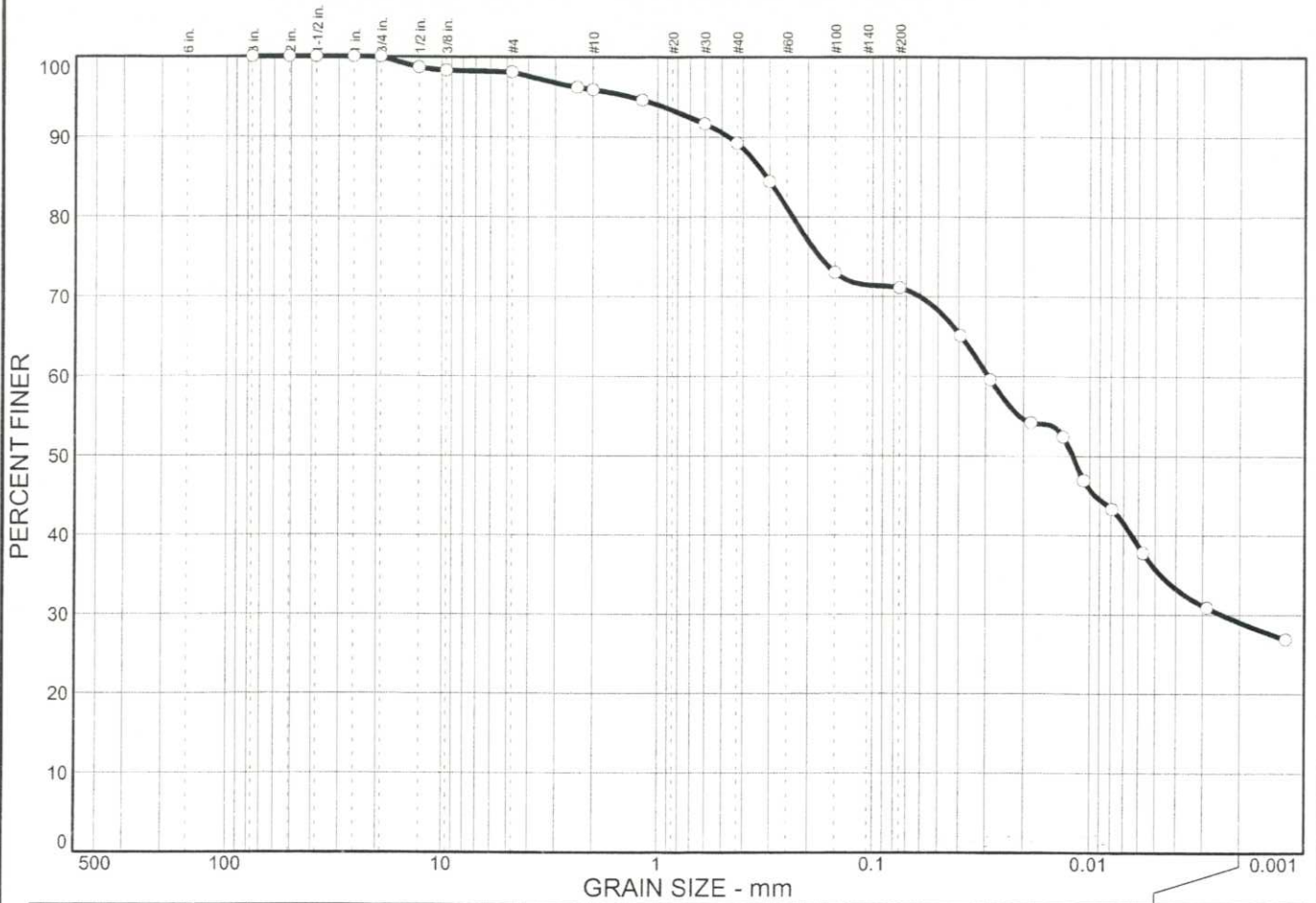
Remarks

* (no specification provided)

Sample No.: S-4 Source of Sample: RB-2 Date: 7-18-03
Location: Stat: 15+50, 6 ft. Rt. "A" Elev./Depth: 8.5'-10'

PATRIOT ENGINEERING and Environmental, Inc.	Client: Bonar Group Project: East Pearl Street Road Rehabilitation, Batesville, Indiana STP 9969(), DES# 0100667 Project No: 1-03-0557 Plate
---	---

Particle Size Distribution Report



% +75 MM	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.1	24.8	42.1	29.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	98.7		
3/8 in.	98.3		
#4	98.1		
#8	96.2		
#10	95.9		
#16	94.6		
#30	91.6		
#40	89.2		
#50	84.4		
#100	73.0		
#200	71.1		

Soil Description

Brown, CLAY LOAM, pH = 7.6

Atterberg Limits

PL= 14 LL= 40 PI= 26

Coefficients

D₈₅= 0.311 D₆₀= 0.0292 D₅₀= 0.0120
D₃₀= 0.0024 D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO= A-6(16)

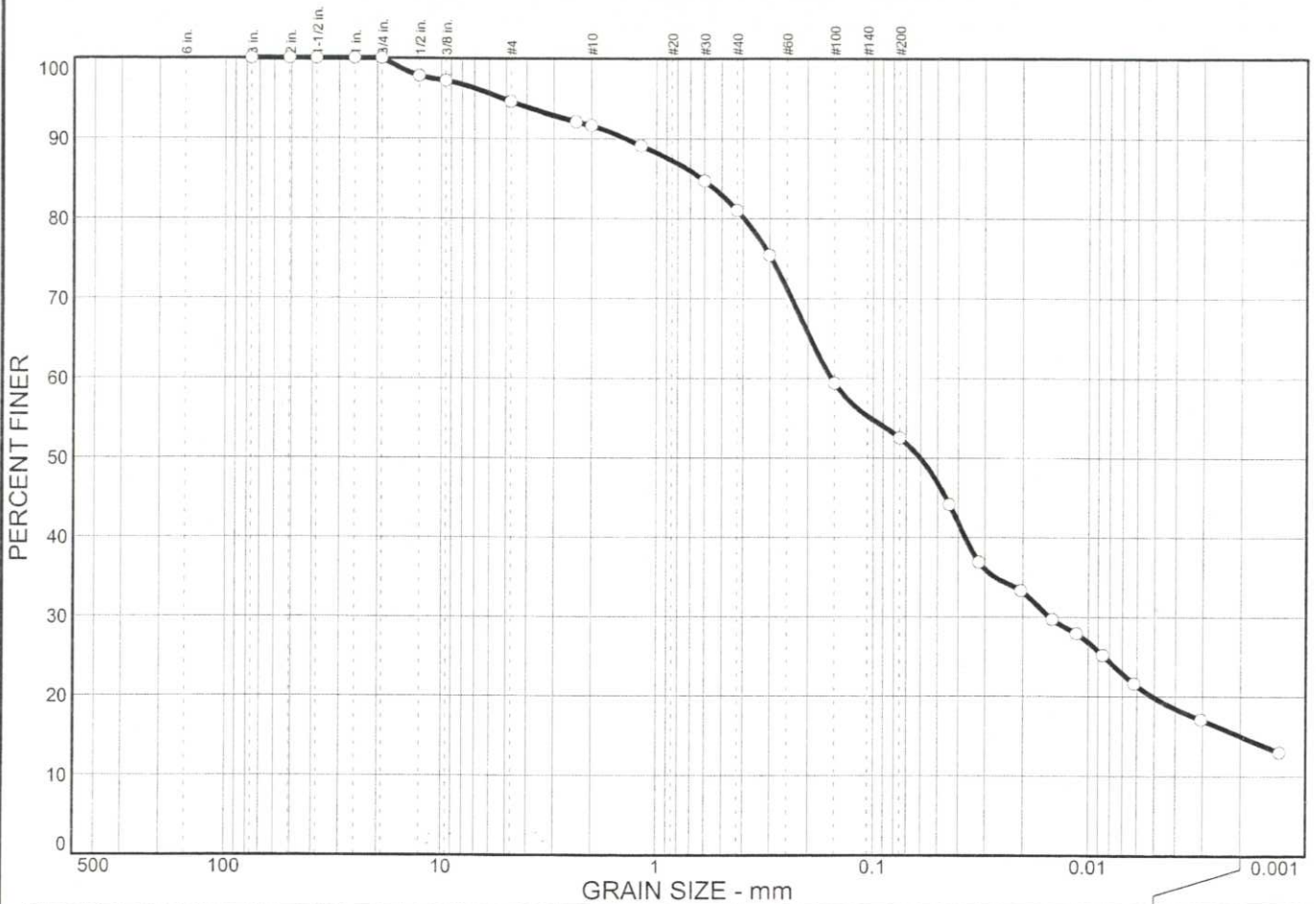
Remarks

* (no specification provided)

Sample No.: CBR-1 **Source of Sample:** RB-3 **Date:** 7-18-03
Location: Stat: 21+50, 2 ft. Rt. "PR-1" **Elev./Depth:** 2-6 ft.

PATRIOT ENGINEERING and Environmental, Inc.	Client: Bonar Group Project: East Pearl Street Road Rehabilitation, Batesville, Indiana STP 9969(), DES# 0100667 Project No: 1-03-0557
Plate	

Particle Size Distribution Report



% +75 MM	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.4	39.1	37.5	15.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	97.8		
3/8 in.	97.2		
#4	94.6		
#8	92.1		
#10	91.6		
#16	89.1		
#30	84.7		
#40	81.0		
#50	75.4		
#100	59.4		
#200	52.5		

Soil Description

Brown, LOAM, pH = 7.5

Atterberg Limits

PL= 12 LL= 26 PI= 14

Coefficients

D₈₅= 0.621 D₆₀= 0.155 D₅₀= 0.0605
D₃₀= 0.0151 D₁₅= 0.0020 D₁₀=
C_u= C_c=

Classification

USCS= AASHTO= A-6(4)

Remarks

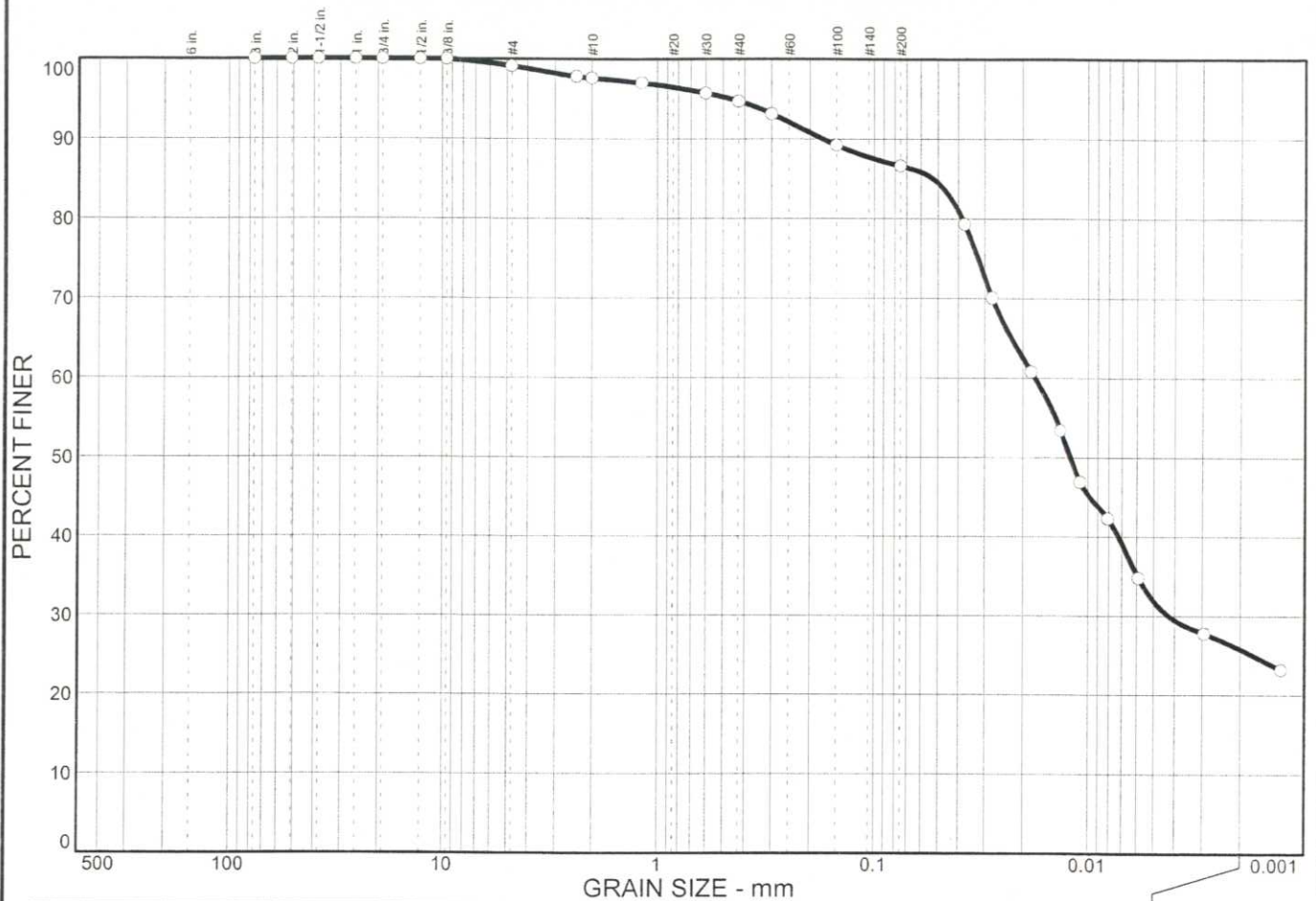
* (no specification provided)

Sample No.: S-3 **Source of Sample:** RB-3 **Date:** 7-18-03
Location: Stat: 21+50, 2 ft. Rt. "PR-1" **Elev./Depth:** 8.5-10 Ft.

PATRIOT ENGINEERING
and Environmental, Inc.

Client: Bonar Group
Project: East Pearl Street Road Rehabilitation, Batesville, Indiana
STP 9969(), DES# 0100667
Project No: 1-03-0557 **Plate**

Particle Size Distribution Report



% +75 MM	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.4	11.0	60.8	25.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	99.1		
#8	97.8		
#10	97.6		
#16	97.0		
#30	95.7		
#40	94.7		
#50	93.1		
#100	89.2		
#200	86.6		

Soil Description

Gray and brown, SILTY CLAY LOAM, pH = 7.4

Atterberg Limits

PL= 16 LL= 40 PI= 24

Coefficients

D₈₅= 0.0528 D₆₀= 0.0176 D₅₀= 0.0121
D₃₀= 0.0043 D₁₅= D₁₀=
C_u= C_c=

Classification

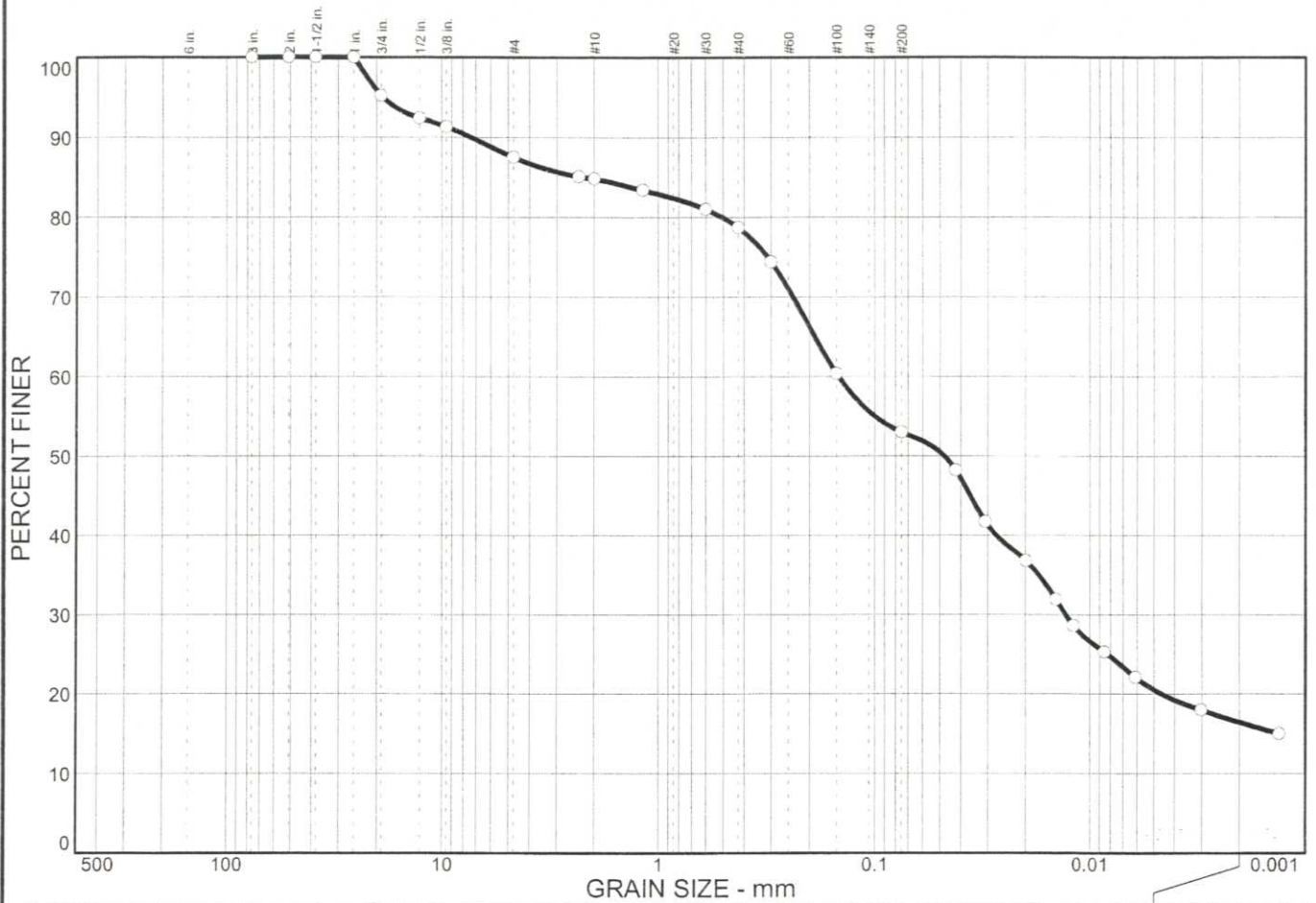
USCS= AASHTO= A-6(20)

Remarks

* (no specification provided)

Sample No.: S-1 Source of Sample: RB-6 Date: 7-18-03
Location: Stat: 39+50, 6ft. Lt. "PR-1" Elev./Depth: 2'-3.5'

Particle Size Distribution Report



% +75 MM	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.2	31.8	36.6	16.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	95.2		
1/2 in.	92.4		
3/8 in.	91.3		
#4	87.5		
#8	85.1		
#10	84.8		
#16	83.4		
#30	81.0		
#40	78.7		
#50	74.4		
#100	60.4		
#200	53.0		

Soil Description

Gray and brown, LOAM, pH = 7.5

Atterberg Limits

PL= 13 LL= 28 PI= 15

Coefficients

D₈₅= 2.23 D₆₀= 0.147 D₅₀= 0.0478
D₃₀= 0.0130 D₁₅= 0.0013 D₁₀=
C_u= C_c=

Classification

USCS= AASHTO= A-6(4)

Remarks

* (no specification provided)

Sample No.: S-1 Source of Sample: RB-12
Location: Stat: 25+29, 10 ft. Rt. "B"

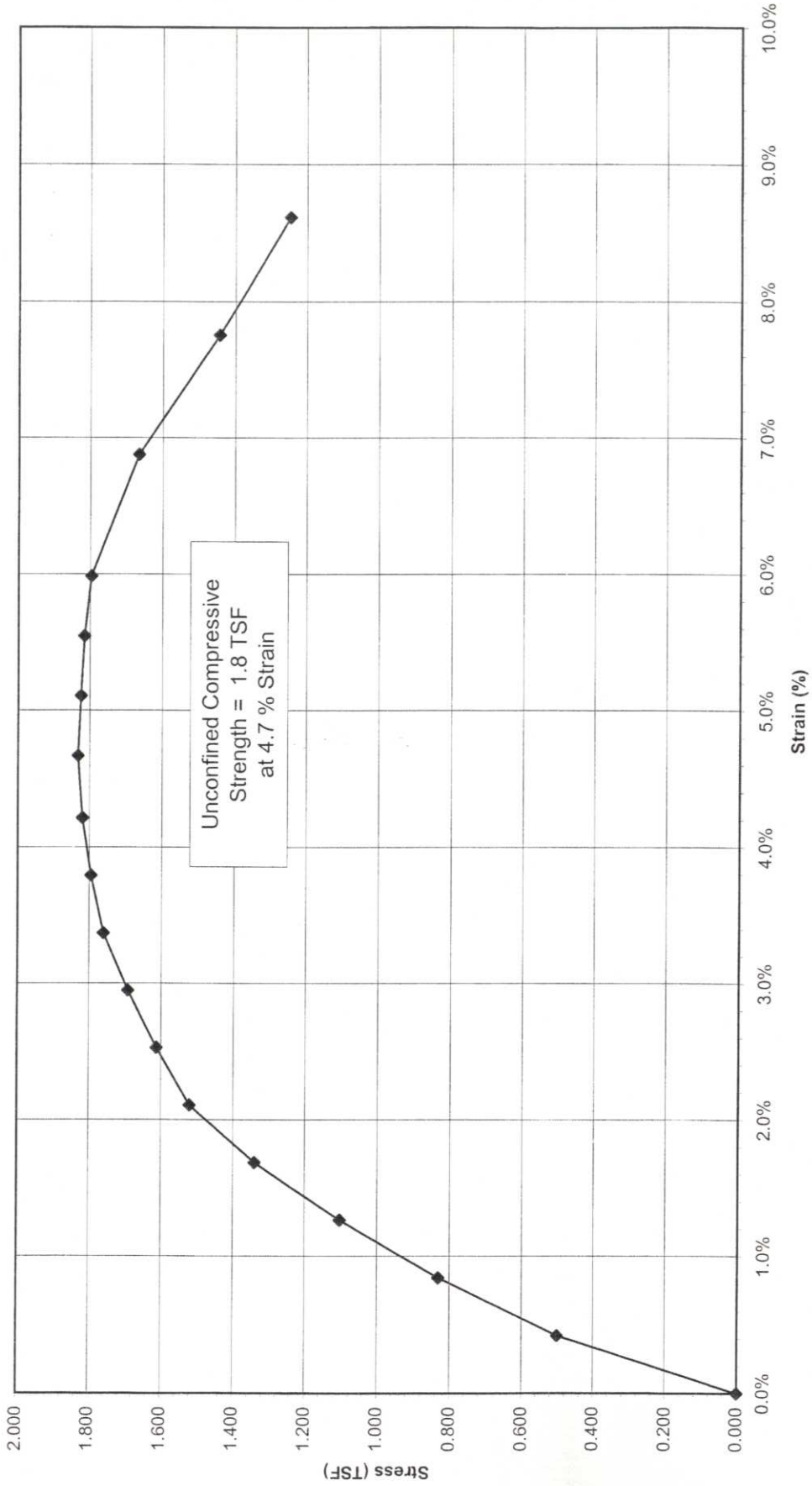
Date: 7-18-03
Elev./Depth: 1.5-3 Ft.

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Client: Bonar Group
Project: East Pearl Street Road Rehabilitation, Batesville, Indiana
STP 9969(), DES# 0100667
Project No: 1-03-0557 Plate

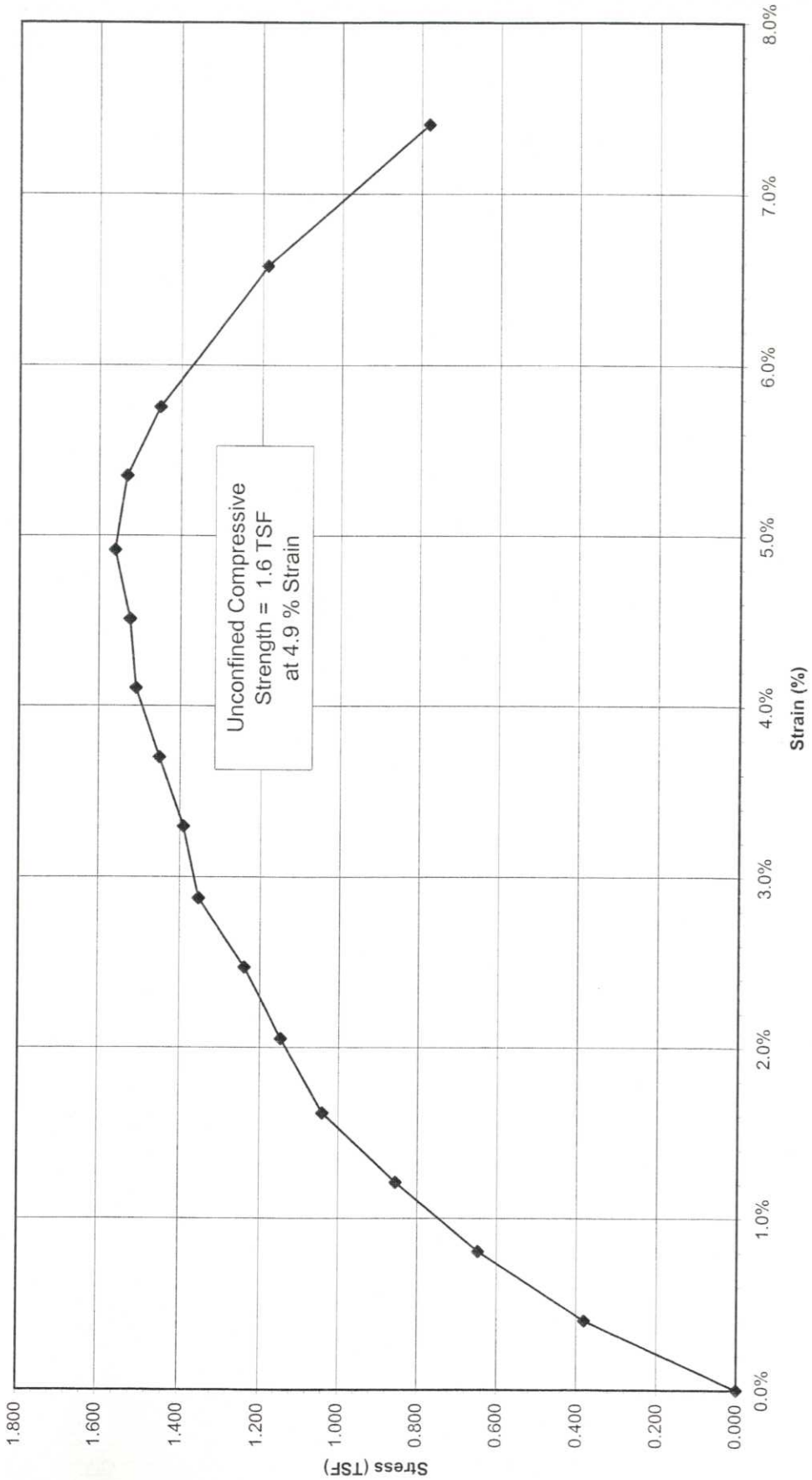
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Indianapolis, IN 46250-2700
(317) 576-8058 FAX: (317) 576-1965

Unconfined Compressive Strength, 7-31-03
East Pearl Street Road Rehabilitation
Patriot Project No. 1-03-0557
INDOT Proj. #STP-9969 (), DES # 0100667
Boring: RB-2, S-3, Depth: 6.4-6.9 ft.



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Unconfined Compressive Strength, 7-31-03
East Pearl Street Road Rehabilitation
Patriot Project No. 1-03-0557
INDOT Proj. #STP-9969 (), DES # 0100667
Boring: RB-16, S-3, Depth: 6.4-6.9 ft.





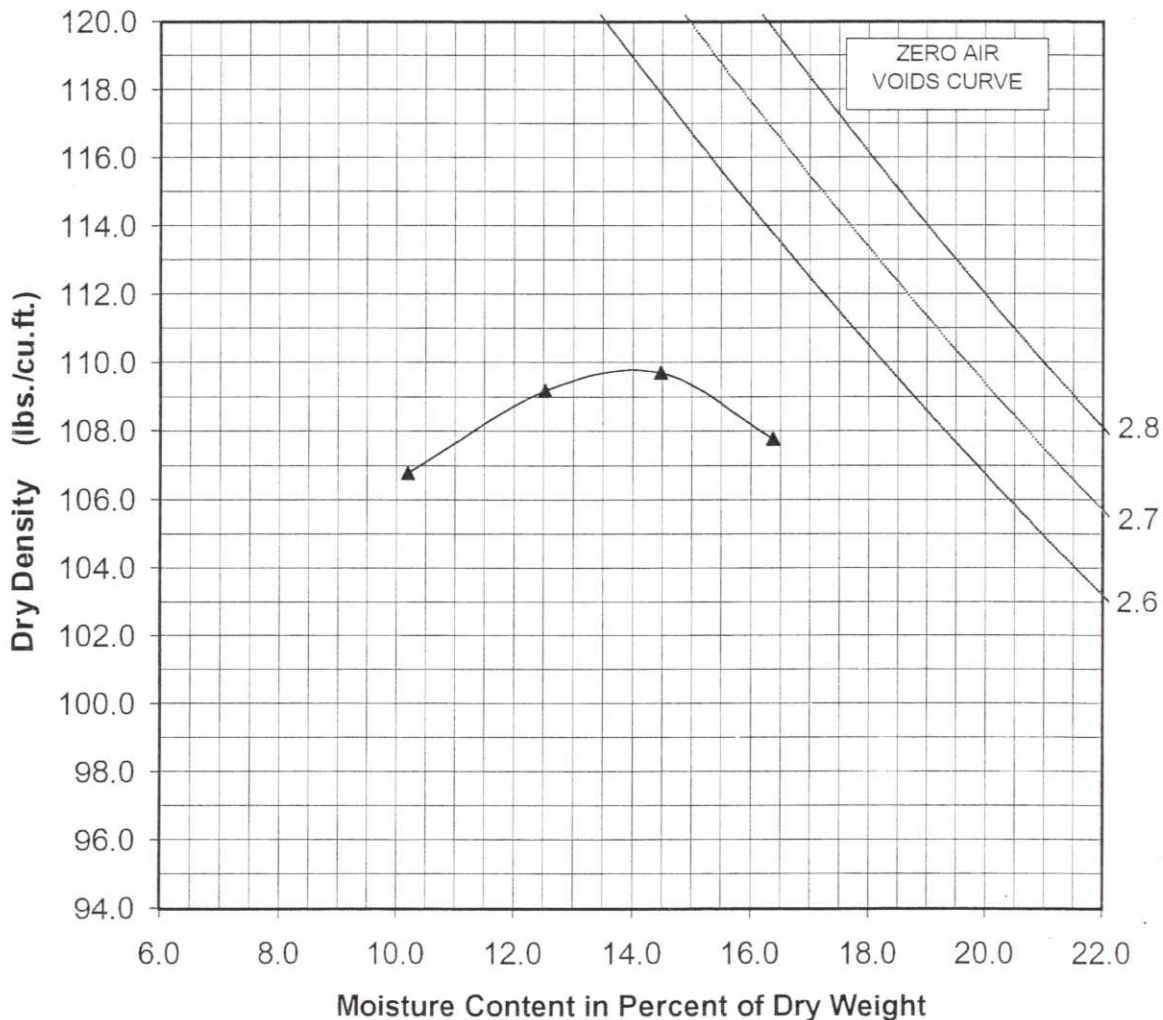
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Moisture-Density (Proctor)

ASTM D 698, AASHTO T99 (Standard)
ASTM D 1557, AASHTO T180 (Modified)

■ Original □ Amended

Project Name:	<u>East Pearl Street Road Rehabilitation</u>	Client:	<u>Bonar Group</u>
Project Number:	<u>1-03-0557 (DES# 0100667)</u>	Client Address:	<u>6420 Castleway West Drive</u>
Date Received:	<u>06/27/2003</u>		<u>Indianapolis, IN 46250</u>
Date Tested:	<u>07/01/2003</u>	Sampled By:	<u>PM</u>
Sample Number:	<u>CBR-1 (RB-3)</u>	Tested By:	<u>RW</u>
Proctor Type:	<u>Standard</u>	Location	<u>Stat: 21+50, 2 ft. Rt "PR-1"</u>



Maximum Dry Density:	<u>110.0</u> pcf	Optimum Moisture Content:	<u>14.0%</u>
Sample Description:	<u>Brown, CLAY LOAM, pH = 7.6</u>		
	<u>LL=40, PL=14, PI=26, As Received Moisture = 23%, Specific Gravity=2.751</u>		
Method:	<u>Manual rammer, procedure C</u>		



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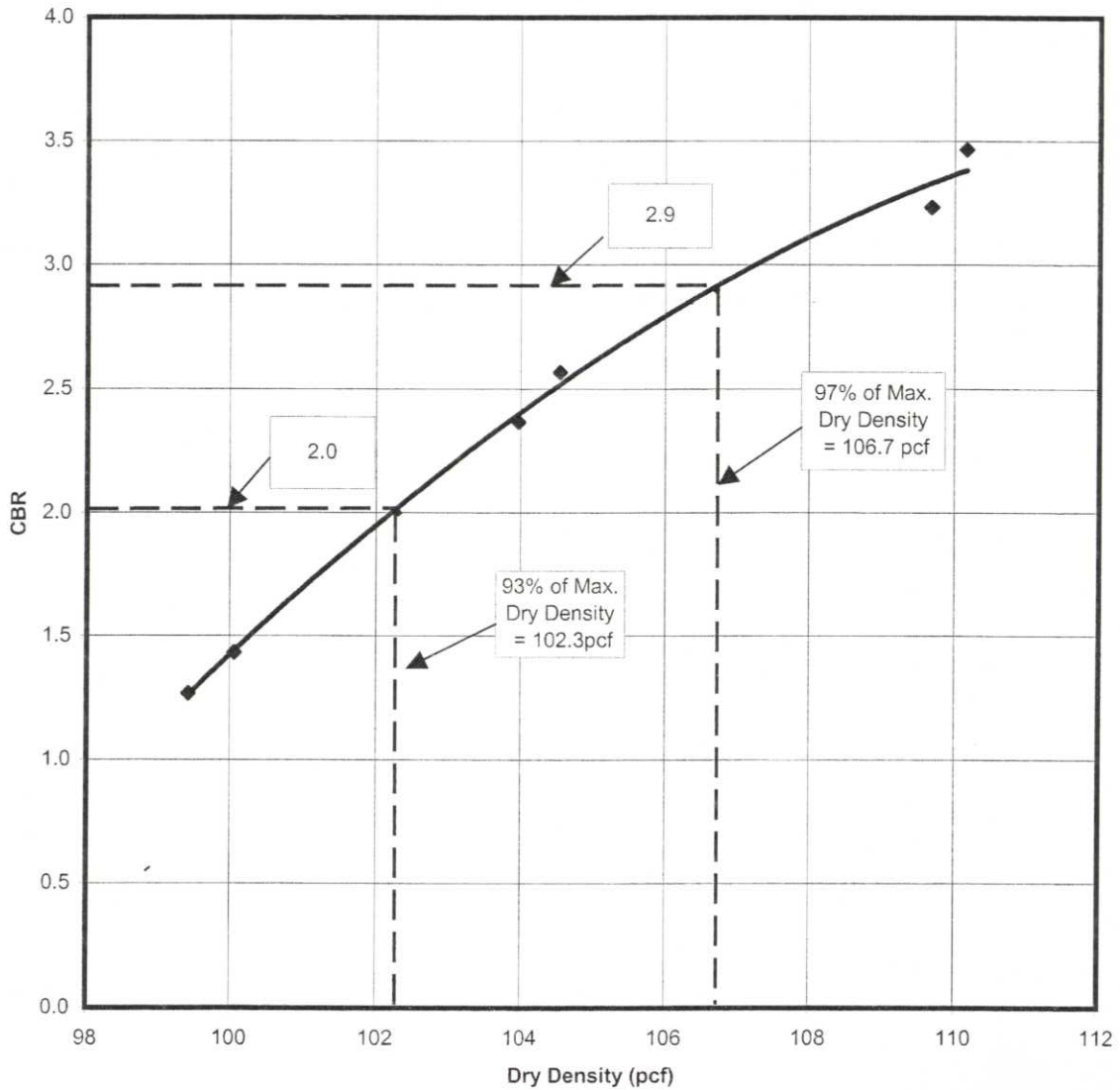
**CBR (California Bearing Ratio) of
Laboratory-Compacted Soils**

ASTM D 1883, AASHTO T193

■ Original Amended

Project Name:	East Pearl Street Road Rehabilitation	Client:	Bonar Group
Project Number:	1-03-0557 (DES #0100667)	Client Address:	6420 Castleway West Drive
Date Received:	06/27/2003		Indianapolis, IN 46250
Date Tested:	07/12/2003	Sampled By:	PM
Sample Number:	CBR-1 (RB-3)	Tested By:	RW
Location:	Station: 21+50, 2 ft. Rt."PR-1"	Sample Source:	Bulk

CBR vs Dry Density





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CBR (California Bearing Ratio) of Laboratory-Compacted Soils

ASTM D 1883, AASHTO T193

Original Amended

Project Name:	East Pearl Street Road Rehabilitation	Client:	Bonar Group
Project Number:	1-03-0557 (DES #0100667)	Client Address:	6420 Castleway West Drive
Sample Number:	CBR-1 (RB-3)		Indianapolis, IN 46250
Location:	Station: 21+50, 2 ft. Rt."PR-1"	Sample Source:	Bulk
Date Received:	06/27/2003	Date Tested:	07/12/2003
		Sampled By:	PM
		Tested by:	RW

Summary of CBR Test Data

Sample Number	Dry Density (pcf)	Molded Water Content (%)	Maximum Dry Density	% of	Blows per Layer	Surcharge Load (lbs)	Water Content, Top 1 inch (%)	Swell (%)	CBR @ 0.1 in.	CBR @ 0.2 in.
1	110.2	14.1%	100.1%		56	25	25.3%	1.77%	3.47	2.82
2	109.7	14.0%	99.7%		56	25	24.8%	1.64%	3.23	2.67
3	100.1	13.8%	91.0%		23	25	22.8%	1.77%	1.43	1.40
4	99.4	14.0%	90.4%		23	25	21.2%	1.70%	1.27	1.24
5	104.5	14.2%	95.0%		32	25	24.7%	1.94%	2.57	2.24
6	104.0	14.4%	94.5%		32	25	23.9%	1.90%	2.37	2.02



AASHTO T 307-99
Resilient Modulus of Subgrade Soils and Untreated Base/Subbase Materials
(RECOMPACTED / THINWALL TUBE SAMPLES)

LABORATORY: Boudreau Engineering, Inc. PROJECT NAME: East Pearl Street Rehabilitation
Swanee, Georgia PROJECT NO.: 1-03-0557 (DES 10100667)
DATE RECEIVED: 07-30-2003 QUANTITY (REPRESENTED): N.A.
IDENTIFICATION MARKS: CBR-1 (RB-3) SOURCE OF MATERIAL: CBR-1 (RB-3) at opt. Moisture

1.	SAMPLING DATE:		N.R.
2.	SAMPLE NUMBER:		CBR-1 opt
3.	LAYER TYPE (1 - Subgrade, 2 - Base/Subbase)		1
4.	MATERIAL TYPE (Type 1 or Type 2)		2
5.	APPROX. DISTANCE FROM TOP OF SUBGRADE TO SAMPLE, ft (for tube samples)		N/A
6.	TEST INFORMATION		
	PRECONDITIONING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)		N
	TESTING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)		N
	TESTING - NUMBER OF LOAD SEQUENCES COMPLETED (0 - 15)		15
7.	SPECIMEN INFO.:		
	SPECIMEN DIAM., inch		
	TOP		2.9
	MIDDLE		2.9
	BOTTOM		2.9
	AVERAGE		2.9
	MEMBRANE THICKNESS (1), inch		0.00
	MEMBRANE THICKNESS (2), inch		0.00
	NET DIAM., inch		2.9
	HEIGHT OF SPECIMEN, CAP AND BASE, inch		5.56
	HEIGHT OF CAP AND BASE, inch		0.0
	INITIAL LENGTH, L_0 , inch		5.6
	INITIAL AREA, A_0 , in ²		6.5
	INITIAL VOLUME $A_0 L_0$, in ³		36.0
	INITIAL WEIGHT, lbs (for tube samples)		N/A
8.	SOIL SPECIMEN WEIGHT (for remolded samples):		
	INITIAL WEIGHT OF CONTAINER AND WET SOIL, grams		1145.40
	FINAL WEIGHT OF CONTAINER AND WET SOIL, grams		0.00
	WEIGHT OF WET SOIL USED, grams		1145.40
9.	SOIL PROPERTIES.:		
	For Remolded Samples:		
	IN SITU MOISTURE CONTENT (NUCLEAR), %		N/A
	IN SITU WET DENSITY (NUCLEAR), pcf		N/A
	or		
	OPTIMUM MOISTURE CONTENT, %		14.0
	MAX. DRY DENSITY, pcf		110.0
	For Tube Samples:		
	IN SITU MOISTURE CONTENT, %		N/A
	MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %		N/A
	WET DENSITY, pcf		N/A
	DRY DENSITY, pcf		N/A
10.	SPECIMEN PROPERTIES (for remolded samples):		
	COMPACTION MOISTURE CONTENT, %		14.0
	MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %		13.9
	COMPACTION DRY DENSITY, gd, pcf		106.4
	TARGET DRY DENSITY, %gd	95	14.0
	COMPACTION LEVEL ACHIEVED		96.7%
	SPECIFIC GRAVITY, G_s	2.751	62.7%
	DEGREE OF SATURATION, %		
11.	QUICK SHEAR TEST		
	STRESS - STRAIN PLOT ATTACHED (Y = YES, N = NO)		Y
	TRIAXIAL SHEAR MAXIMUM STRENGTH (MAX. LOAD/X-SECTION AREA), psi		41
	SPECIMEN FAIL DURING TRIAXIAL SHEAR? (Y = YES, N = NO)		N
12.	TEST DATE		08-05-2003
13.	GENERAL REMARKS:		

TESTED BY RLB DATE 08-05-2003

Boudreau Engineering, Inc.

AASHTO T307-99 REPORT FORM X1.1 Resilient Modulus of Subgrade Soils and Untreated Base/Subbase Materials

1. PROJECT NO(S):
2. PROJECT NAME: 1-03-0557 (DES 10100667)
3. SOURCE OF MATERIAL: East Pearl Street Rehabilitation
4. REMOLDING TARGETS: CBR-1 (RB-3) at opt. Moisture
5. LAYER TYPE (1 - subgrade, 2 - base/subbase) 1
6. MATERIAL TYPE (Type 1 or Type 2) 2
7. TEST DATE 08-05-2003
8. RESILIENT MODULUS TESTING

LABORATORY: Boudreau Engineering, Inc.
Suwanee, Georgia

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber Confining Pressure	Nominal Maximum Axial Stress	Cycle No.	Actual Applied Max. Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Max. Axial Stress	Actual Applied Cyclic Stress	Actual Applied Contact Stress	Actual Applied LVDT #1 Reading	Actual Applied LVDT #2 Reading	Average Recov Def. LVDT 1 and 2	Resilient Strain	Resilient Modulus
DESIGNATION UNIT PRECISION	S3 psi	psi	---	Pmax lbs	Pcyclic lbs	Pcontact lbs	Smax psi	Scyclic psi	Scontact psi	H1 in	H2 in	Havg in	ϵ_p in/in	Mr psi
SEQUENCE 1	6.0	2.0	96	13.5	12.4	1.2	2.1	1.9	0.2	0.00086	0.00084	0.00085	0.00015	12,520
			97	13.7	12.5	1.1	2.1	1.9	0.2	0.00085	0.00083	0.00084	0.00015	12,830
			98	13.7	12.6	1.1	2.1	1.9	0.2	0.00085	0.00083	0.00084	0.00015	12,888
			99	13.8	12.7	1.1	2.1	2.0	0.2	0.00086	0.00083	0.00084	0.00015	12,901
			100	13.4	12.3	1.2	2.1	1.9	0.2	0.00086	0.00083	0.00085	0.00015	12,471
	COLUMN AVERAGE			13.6	12.5	1.1	2.1	1.9	0.2	0.00086	0.00083	0.00084	0.00015	12,722
	STANDARD DEV.			0.1	0.2	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	209

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at opt. Moisture									
SEQUENCE 2	6.0	4.0	96	26.5	24.3	2.2	4.1	3.8	0.3	0.00162	0.00160	0.00161	0.00029	12,950							
	97	26.4	24.2	2.2	4.1	3.7	0.3	0.00163	0.00161	0.00162	0.00029	12,825									
	98	26.4	24.2	2.2	4.1	3.7	0.3	0.00162	0.00161	0.00162	0.00029	12,884									
	99	26.6	24.3	2.3	4.1	3.8	0.3	0.00162	0.00161	0.00162	0.00029	12,958									
	100	26.5	24.2	2.2	4.1	3.7	0.3	0.00163	0.00160	0.00161	0.00029	12,933									
	COLUMN AVERAGE	26.5	24.2	2.2	4.1	3.7	0.3	0.00163	0.00161	0.00162	0.00029	12,910									
	STANDARD DEV.	0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	56									
	6.0	6.0	96	39.4	35.9	3.5	6.1	5.5	0.5	0.00245	0.00242	0.00244	0.00044	12,657							
	97	39.4	36.1	3.4	6.1	5.6	0.5	0.00244	0.00243	0.00244	0.00044	12,731									
	98	39.4	35.9	3.5	6.1	5.5	0.5	0.00246	0.00242	0.00244	0.00044	12,646									
99	39.2	35.6	3.5	6.1	5.5	0.5	0.00246	0.00242	0.00244	0.00044	12,580										
100	39.3	35.8	3.5	6.1	5.5	0.5	0.00245	0.00242	0.00244	0.00044	12,636										
COLUMN AVERAGE	39.3	35.8	3.5	6.1	5.5	0.5	0.00245	0.00242	0.00244	0.00044	12,650										
STANDARD DEV.	0.1	0.1	0.1	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	54										
SEQUENCE 4	6.0	8.0	96	52.2	47.4	4.8	8.1	7.3	0.7	0.00336	0.00333	0.00334	0.00060	12,200							
	97	52.1	47.2	4.9	8.1	7.3	0.8	0.00336	0.00333	0.00334	0.00060	12,156									
	98	52.1	47.2	4.8	8.1	7.3	0.7	0.00337	0.00332	0.00334	0.00060	12,157									
	99	52.1	47.3	4.8	8.1	7.3	0.7	0.00336	0.00332	0.00334	0.00060	12,180									
	100	52.1	47.3	4.8	8.1	7.3	0.7	0.00336	0.00333	0.00335	0.00060	12,177									
	COLUMN AVERAGE	52.1	47.3	4.8	8.1	7.3	0.7	0.00336	0.00332	0.00334	0.00060	12,174									
	STANDARD DEV.	0.0	0.1	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	18									
	6.0	10.0	96	64.7	58.6	6.1	10.0	9.1	0.9	0.00435	0.00430	0.00432	0.00078	11,651							
	97	64.6	58.6	6.1	10.0	9.1	0.9	0.00435	0.00430	0.00433	0.00078	11,651									
	98	65.0	58.9	6.1	10.0	9.1	0.9	0.00436	0.00430	0.00433	0.00078	11,711									
99	64.7	58.7	6.1	10.0	9.1	0.9	0.00435	0.00430	0.00433	0.00078	11,669										
100	64.8	58.8	6.0	10.0	9.1	0.9	0.00434	0.00430	0.00432	0.00078	11,704										
COLUMN AVERAGE	64.8	58.7	6.1	10.0	9.1	0.9	0.00435	0.00430	0.00432	0.00078	11,677										
STANDARD DEV.	0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	29										

Project Name: East Pearl Street Rehabilitation Identification Marks: CBR-1 (RB-3)

Material Source: CBR-1 (RB-3) at opt. Moisture

SEQUENCE 6	4.0	2.0	96	13.9	12.4	1.5	2.2	1.9	0.2	0.00091	0.00088	0.00089	0.00016	11,961	
			97	13.9	12.3	1.6	2.2	1.9	0.2	0.00091	0.00088	0.00089	0.00016	11,885	
			98	14.1	12.6	1.5	2.2	1.9	0.2	0.00091	0.00088	0.00090	0.00016	12,086	
			99	14.1	12.6	1.5	2.2	1.9	0.2	0.00091	0.00087	0.00089	0.00016	12,136	
			100	14.0	12.4	1.6	2.2	1.9	0.2	0.00092	0.00088	0.00090	0.00016	11,916	
		COLUMN AVERAGE		14.0	12.5	1.5	2.2	1.9	0.2	0.00091	0.00088	0.00089	0.00016	11,997	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	109	
	SEQUENCE 7	4.0	4.0	96	26.3	24.1	2.2	4.1	3.7	0.3	0.00176	0.00172	0.00174	0.00031	11,913
				97	26.3	24.1	2.2	4.1	3.7	0.3	0.00176	0.00174	0.00175	0.00031	11,865
				98	26.4	24.2	2.2	4.1	3.7	0.3	0.00177	0.00173	0.00175	0.00031	11,933
			99	26.2	23.9	2.3	4.1	3.7	0.4	0.00177	0.00173	0.00175	0.00031	11,771	
			100	26.3	24.1	2.2	4.1	3.7	0.3	0.00176	0.00172	0.00174	0.00031	11,920	
		COLUMN AVERAGE		26.3	24.1	2.2	4.1	3.7	0.3	0.00176	0.00173	0.00175	0.00031	11,880	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	66	
SEQUENCE 8		4.0	6.0	96	39.3	35.7	3.6	6.1	5.5	0.6	0.00263	0.00257	0.00260	0.00047	11,829
				97	39.3	35.7	3.6	6.1	5.5	0.6	0.00261	0.00257	0.00259	0.00047	11,848
				98	39.1	35.6	3.5	6.1	5.5	0.5	0.00262	0.00257	0.00259	0.00047	11,813
			99	39.3	35.7	3.6	6.1	5.5	0.6	0.00262	0.00256	0.00259	0.00047	11,847	
			100	39.2	35.7	3.5	6.1	5.5	0.5	0.00263	0.00257	0.00260	0.00047	11,832	
		COLUMN AVERAGE		39.2	35.7	3.5	6.1	5.5	0.5	0.00262	0.00257	0.00259	0.00047	11,834	
		STANDARD DEV.		0.1	0.0	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	14	
	SEQUENCE 9	4.0	8.0	96	52.1	47.2	4.9	8.1	7.3	0.8	0.00350	0.00347	0.00348	0.00063	11,663
				97	51.9	47.1	4.8	8.0	7.3	0.7	0.00350	0.00346	0.00348	0.00063	11,646
				98	52.2	47.4	4.8	8.1	7.3	0.7	0.00351	0.00346	0.00348	0.00063	11,706
			99	52.1	47.3	4.8	8.1	7.3	0.7	0.00351	0.00346	0.00348	0.00063	11,692	
			100	52.2	47.3	4.8	8.1	7.3	0.7	0.00351	0.00347	0.00349	0.00063	11,671	
		COLUMN AVERAGE		52.1	47.3	4.8	8.1	7.3	0.7	0.00351	0.00346	0.00348	0.00063	11,676	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	24	

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at opt. Moisture									
SEQUENCE 10	4.0	10.0	96	64.9	58.9	6.0	10.0	9.1	0.9	0.00443	0.00440	0.00442	0.00079	11,464							
	97	64.6	58.6	6.0	10.0	9.1	0.9	0.00445	0.00440	0.00442	0.00080	11,403									
	98	64.7	58.7	6.1	10.0	9.1	0.9	0.00443	0.00440	0.00442	0.00079	11,426									
	99	64.8	58.7	6.1	10.0	9.1	0.9	0.00444	0.00441	0.00442	0.00079	11,429									
	100	64.6	58.6	6.0	10.0	9.1	0.9	0.00444	0.00441	0.00442	0.00079	11,412									
	COLUMN AVERAGE	64.7	58.7	6.0	10.0	9.1	0.9	0.00444	0.00440	0.00442	0.00079	11,427									
	STANDARD DEV.	0.1	0.1	0.1	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	23									
	2.0	2.0	14.3	12.4	1.9	2.2	1.9	0.3	0.00098	0.00096	0.00097	0.00017	11,017								
	97	14.4	12.5	1.9	2.2	1.9	0.3	0.00098	0.00096	0.00097	0.00017	11,075									
	98	14.3	12.3	1.9	2.2	1.9	0.3	0.00099	0.00095	0.00097	0.00017	10,959									
99	14.3	12.3	2.0	2.2	1.9	0.3	0.00099	0.00095	0.00097	0.00017	10,907										
100	14.2	12.4	1.9	2.2	1.9	0.3	0.00099	0.00095	0.00097	0.00017	10,963										
COLUMN AVERAGE	14.3	12.4	1.9	2.2	1.9	0.3	0.00098	0.00095	0.00097	0.00017	10,984										
STANDARD DEV.	0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	64										
2.0	4.0	26.2	24.0	2.2	4.1	3.7	0.3	0.00192	0.00190	0.00191	0.00034	10,851									
97	26.2	23.9	2.2	4.0	3.7	0.3	0.00192	0.00188	0.00190	0.00034	10,830										
98	26.1	23.9	2.3	4.0	3.7	0.3	0.00192	0.00188	0.00190	0.00034	10,802										
99	26.3	24.0	2.2	4.1	3.7	0.3	0.00192	0.00189	0.00190	0.00034	10,874										
100	26.3	24.1	2.2	4.1	3.7	0.3	0.00192	0.00189	0.00190	0.00034	10,900										
COLUMN AVERAGE	26.2	24.0	2.2	4.1	3.7	0.3	0.00192	0.00189	0.00190	0.00034	10,852										
STANDARD DEV.	0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	38										
2.0	6.0	39.3	35.7	3.6	6.1	5.5	0.6	0.00283	0.00278	0.00280	0.00050	10,959									
97	39.1	35.5	3.6	6.0	5.5	0.6	0.00282	0.00278	0.00280	0.00050	10,920										
98	39.2	35.8	3.5	6.1	5.5	0.5	0.00282	0.00277	0.00280	0.00050	11,000										
99	39.1	35.6	3.5	6.0	5.5	0.5	0.00283	0.00277	0.00280	0.00050	10,935										
100	39.1	35.5	3.5	6.0	5.5	0.5	0.00283	0.00278	0.00280	0.00050	10,909										
COLUMN AVERAGE	39.2	35.6	3.5	6.1	5.5	0.5	0.00283	0.00277	0.00280	0.00050	10,945										
STANDARD DEV.	0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	36										

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)					Material Source: CBR-1 (RB-3) at opt. Moisture							
SEQUENCE 14	2.0	8.0	96	52.0	47.4	4.7	8.0	7.3	0.7	0.00374	0.00371	0.00372	0.00067	10,955
			97	52.0	47.3	4.8	8.0	7.3	0.7	0.00374	0.00370	0.00372	0.00067	10,930
			98	52.0	47.1	4.8	8.0	7.3	0.7	0.00374	0.00370	0.00372	0.00067	10,915
			99	52.0	47.2	4.8	8.0	7.3	0.7	0.00375	0.00371	0.00373	0.00067	10,907
			100	51.9	47.1	4.8	8.0	7.3	0.7	0.00374	0.00371	0.00372	0.00067	10,884
		COLUMN AVERAGE		52.0	47.2	4.8	8.0	7.3	0.7	0.00374	0.00370	0.00372	0.00067	10,918
	STANDARD DEV.		0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	26
SEQUENCE 15	2.0	10.0	96	64.8	58.7	6.1	10.0	9.1	0.9	0.00468	0.00467	0.00467	0.00084	10,801
			97	64.8	58.7	6.1	10.0	9.1	0.9	0.00469	0.00465	0.00467	0.00084	10,806
			98	65.0	58.9	6.1	10.0	9.1	0.9	0.00469	0.00466	0.00468	0.00084	10,830
			99	64.7	58.6	6.1	10.0	9.1	0.9	0.00469	0.00466	0.00468	0.00084	10,779
			100	64.7	58.6	6.1	10.0	9.1	0.9	0.00468	0.00467	0.00467	0.00084	10,790
		COLUMN AVERAGE		64.8	58.7	6.1	10.0	9.1	0.9	0.00469	0.00466	0.00467	0.00084	10,801
	STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	19

TESTED BY _____ RLB _____ DATE _____ 08-05-2003

Boudreau Engineering, Inc.

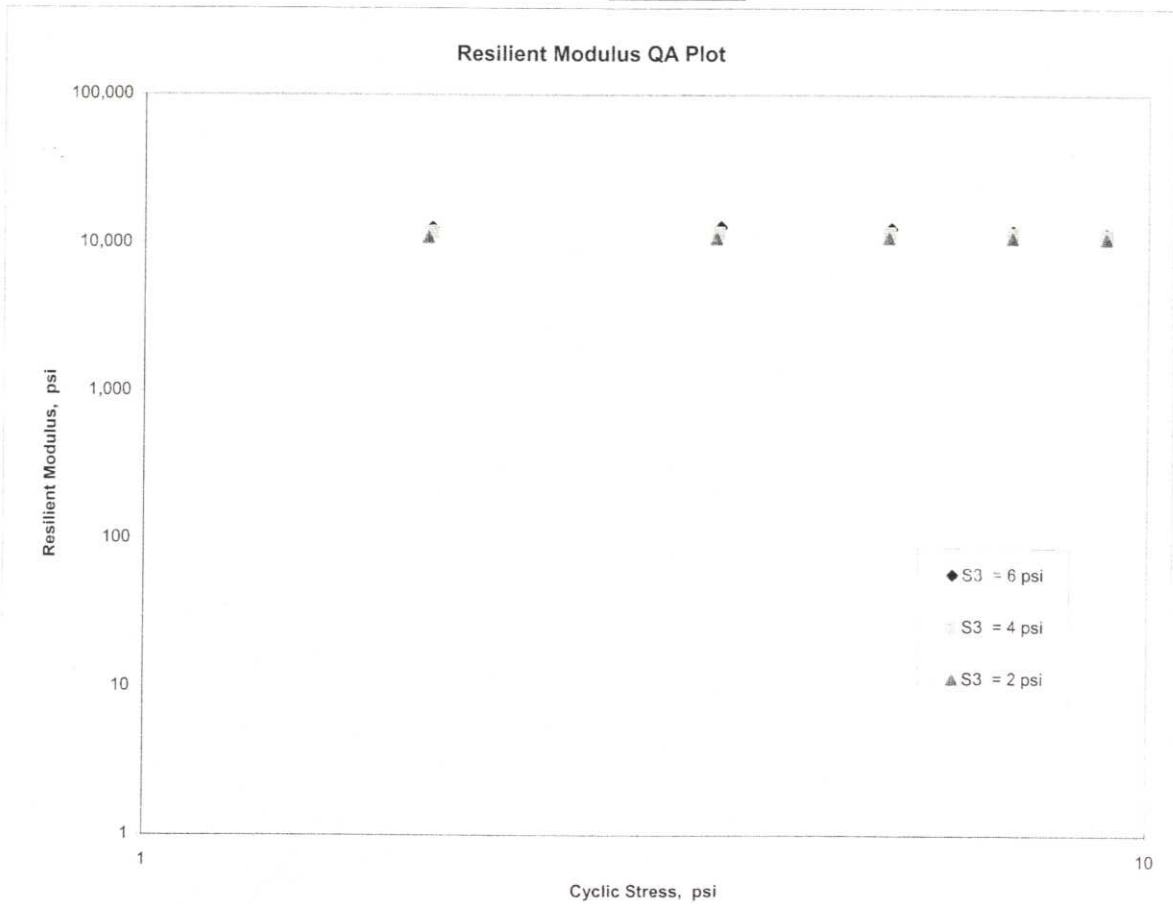
AASHTO T307-99

FIGURE 1 - Logarithmic Plot of Resilient Modulus (M_R) vs Cyclic Stress (S_C)

1. PROJECT NO(S):	1-03-0557 (DES 10100667)
2. PROJECT NAME:	East Pearl Street Rehabilitation
3. SOURCE OF MATERIAL:	CBR-1 (RB-3) at opt. Moisture
4. REMOLDING TARGETS:	95% Maximum Dry Density at 14% Moisture Content
5. LAYER TYPE (1 - subgrade, 2 - base/subbase)	1
6. MATERIAL TYPE (Type 1 or Type 2)	2
7. TEST DATE	08-05-2003

$$M_R = K_1 (S_C)^{K_2} (S_3)^{K_5}$$

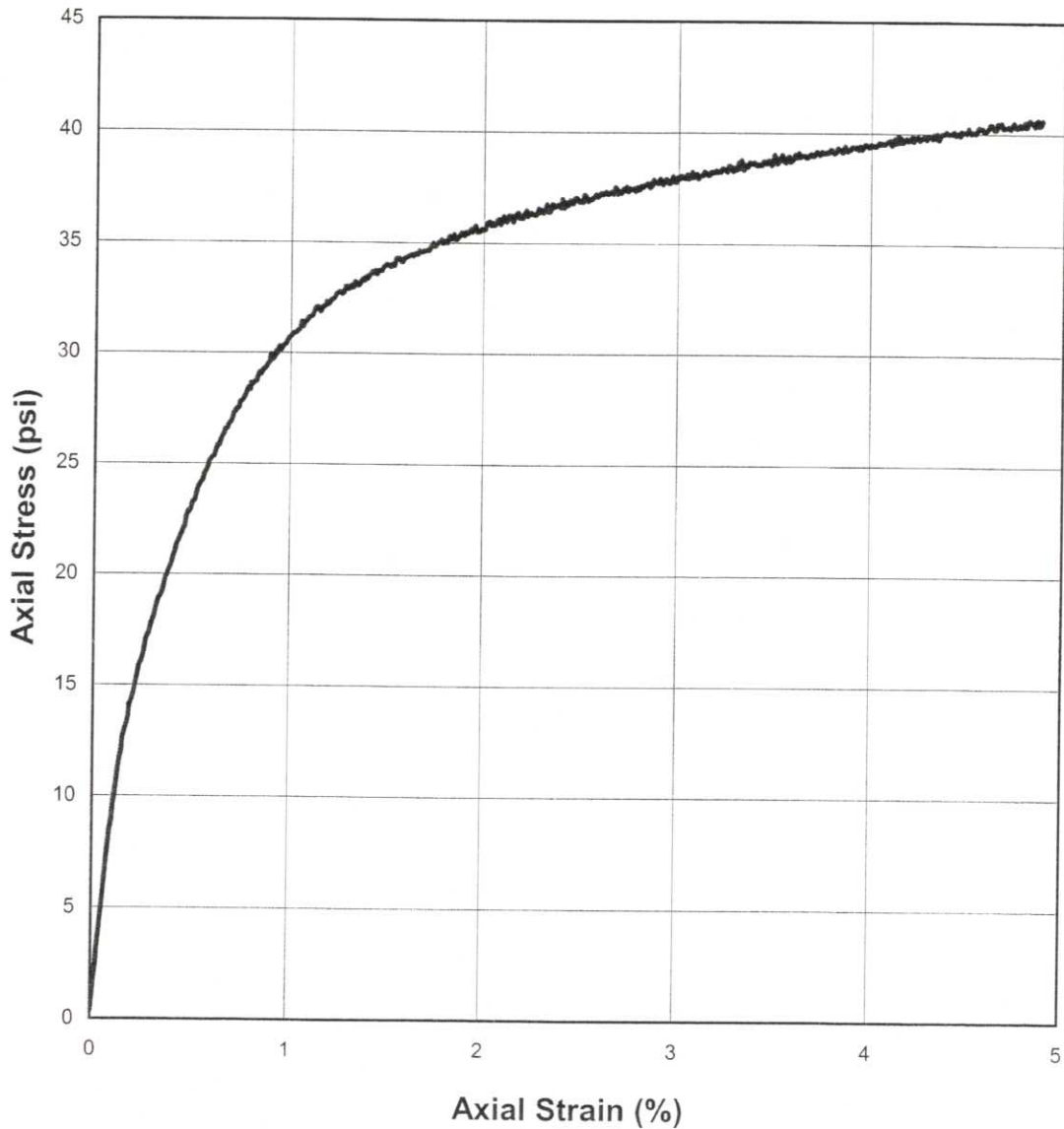
K1 =	10,488
K2 =	-0.02846
K5 =	0.11790
R2 =	0.91



AASHTO T307-99

FIGURE 2 - Quick Shear Stress vs Strain

1. PROJECT NO(S):	1-03-0557 (DES 10100667)
2. PROJECT NAME:	East Pearl Street Rehabilitation
3. SOURCE OF MATERIAL:	CBR-1 (RB-3) at opt. Moisture
4. REMOLDING TARGETS:	95% Maximum Dry Density at 14% Moisture Content
5. LAYER TYPE (1 - subgrade, 2 - base/subbase)	1
6. MATERIAL TYPE (Type 1 or Type 2)	2
7. TEST DATE	08-05-2003





AASHTO T 307-99
Resilient Modulus of Subgrade Soils and Untreated Base/Subbase Materials
(RECOMPACTED / THINWALL TUBE SAMPLES)

LABORATORY: Boudreau Engineering, Inc. PROJECT NAME: East Pearl Street Rehabilitation
Suwanee, Georgia PROJECT NO.: 1-03-0557 (DES 10100667)
DATE RECEIVED: 07-30-2003 QUANTITY (REPRESENTED): N.A.
IDENTIFICATION MARKS: CBR-1 (RB-3) SOURCE OF MATERIAL: CBR-1 (RB-3) at +2% above opt.

1.	SAMPLING DATE:	<u>N.R.</u>
2.	SAMPLE NUMBER:	<u>CBR-1 wet</u>
3.	LAYER TYPE (1 - Subgrade, 2 - Base/Subbase)	<u>1</u>
4.	MATERIAL TYPE (Type 1 or Type 2)	<u>2</u>
5.	APPROX. DISTANCE FROM TOP OF SUBGRADE TO SAMPLE, ft (for tube samples)	<u>N/A</u>
6.	TEST INFORMATION	
	<i>PRECONDITIONING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)</i>	<u>N</u>
	<i>TESTING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)</i>	<u>N</u>
	<i>TESTING - NUMBER OF LOAD SEQUENCES COMPLETED (0 - 15)</i>	<u>15</u>
7.	SPECIMEN INFO:	
	<i>SPECIMEN DIAM., inch</i>	
	TOP	<u>2.9</u>
	MIDDLE	<u>2.9</u>
	BOTTOM	<u>2.9</u>
	AVERAGE	<u>2.9</u>
	<i>MEMBRANE THICKNESS (1), inch</i>	<u>0.00</u>
	<i>MEMBRANE THICKNESS (2), inch</i>	<u>0.00</u>
	<i>NET DIAM., inch</i>	<u>2.9</u>
	<i>HEIGHT OF SPECIMEN, CAP AND BASE, inch</i>	<u>5.55</u>
	<i>HEIGHT OF CAP AND BASE, inch</i>	<u>0.0</u>
	<i>INITIAL LENGTH, Lo, inch</i>	<u>5.5</u>
	<i>INITIAL AREA, Ao, in²</i>	<u>6.5</u>
	<i>INITIAL VOLUME Ao Lo, in³</i>	<u>35.8</u>
	<i>INITIAL WEIGHT, lbs (for tube samples)</i>	<u>N/A</u>
8.	SOIL SPECIMEN WEIGHT (for remolded samples):	
	<i>INITIAL WEIGHT OF CONTAINER AND WET SOIL, grams</i>	<u>1167.04</u>
	<i>FINAL WEIGHT OF CONTAINER AND WET SOIL, grams</i>	<u>0.00</u>
	<i>WEIGHT OF WET SOIL USED, grams</i>	<u>1167.04</u>
9.	SOIL PROPERTIES:	
	<i>For Remolded Samples:</i>	
	<i>IN SITU MOISTURE CONTENT (NUCLEAR), %</i>	<u>N/A</u>
	<i>IN SITU WET DENSITY (NUCLEAR), pcf</i>	<u>N/A</u>
	or	
	<i>OPTIMUM MOISTURE CONTENT, %</i>	<u>14.0</u>
	<i>MAX. DRY DENSITY, pcf</i>	<u>110.0</u>
	<i>For Tube Samples:</i>	
	<i>IN SITU MOISTURE CONTENT, %</i>	<u>N/A</u>
	<i>MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %</i>	<u>N/A</u>
	<i>WET DENSITY, pcf</i>	<u>N/A</u>
	<i>DRY DENSITY, pcf</i>	<u>N/A</u>
10.	SPECIMEN PROPERTIES (for remolded samples):	
	<i>COMPACTION MOISTURE CONTENT, %</i>	<u>16.0</u>
	<i>MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %</i>	<u>15.9</u>
	<i>COMPACTION DRY DENSITY, gd, pcf</i>	<u>107.0</u>
	<i>TARGET DRY DENSITY, %gd</i> <u>95</u> <i>TARGET MOISTURE CONTENT, %</i>	<u>16.0</u>
	<i>COMPACTION LEVEL ACHIEVED</i>	<u>97.3%</u>
	<i>SPECIFIC GRAVITY, Gs</i> <u>2.751</u> <i>DEGREE OF SATURATION, %</i>	<u>72.8%</u>
11.	QUICK SHEAR TEST	
	<i>STRESS - STRAIN PLOT ATTACHED (Y = YES, N = NO)</i>	<u>Y</u>
	<i>TRIAxIAL SHEAR MAXIMUM STRENGTH (MAX. LOAD/X-SECTION AREA), psi</i>	<u>27</u>
	<i>SPECIMEN FAIL DURING TRIAXIAL SHEAR? (Y = YES, N = NO)</i>	<u>N</u>
12.	TEST DATE	<u>08-05-2003</u>
13.	GENERAL REMARKS:	

TESTED BY RLB DATE 08-05-2003



AASHTO T307-99 REPORT FORM X1.1
Resilient Modulus of Subgrade Soils and Untreated Base/Subbase Materials

1. PROJECT NO(S):
2. PROJECT NAME:
3. SOURCE OF MATERIAL:
4. REMOLDING TARGETS:
5. LAYER TYPE (1 - subgrade, 2 - base/subbase)
6. MATERIAL TYPE (Type 1 or Type 2)
7. TEST DATE
8. RESILIENT MODULUS TESTING

1-03-0557 (DES 10100667)
 East Pearl Street Rehabilitation
 CBR-1 (RB-3) at +2% above opt.
 95% Maximum Dry Density at 16% Moisture Content
 1
 2
 08-05-2003

LABORATORY: Boudreau Engineering, Inc.
 Suwanee, Georgia

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber	Nominal	Cycle	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Average	Resilient	Resilient
DESIGNATION	S3	psi	c1	Pmax	Pcyclic	Pcontact	Smax	Scyclic	Sccontact	H1	H2	Havg	εp	Mr
UNIT	psi	psi	---	lbs	lbs	lbs	psi	psi	psi	in	in	in	in/in	psi
PRECISION														
SEQUENCE 1	6.0	2.0	96	13.5	12.3	1.2	2.1	1.9	0.2	0.00102	0.00098	0.00100	0.00018	10,505
			97	13.6	12.3	1.3	2.1	1.9	0.2	0.00102	0.00099	0.00100	0.00018	10,543
			98	13.5	12.2	1.2	2.1	1.9	0.2	0.00102	0.00098	0.00100	0.00018	10,469
			99	13.4	12.3	1.2	2.1	1.9	0.2	0.00101	0.00099	0.00100	0.00018	10,517
			100	13.6	12.3	1.2	2.1	1.9	0.2	0.00102	0.00098	0.00100	0.00018	10,565
				13.5	12.3	1.2	2.1	1.9	0.2	0.00102	0.00099	0.00100	0.00018	10,520
				0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	37

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at +2% above opt.									
SEQUENCE 2	6.0	4.0	96	26.0	23.7	2.3	4.0	3.7	0.3	0.00197	0.00192	0.00194	0.00035	10,494							
			97	26.3	23.9	2.3	4.1	3.7	0.4	0.00196	0.00191	0.00194	0.00035	10,605							
			98	26.2	23.9	2.3	4.1	3.7	0.4	0.00197	0.00191	0.00194	0.00035	10,555							
			99	26.0	23.7	2.3	4.0	3.7	0.4	0.00197	0.00191	0.00194	0.00035	10,506							
			100	26.1	23.9	2.2	4.0	3.7	0.3	0.00197	0.00191	0.00194	0.00035	10,548							
		COLUMN AVERAGE		26.1	23.8	2.3	4.0	3.7	0.4	0.00197	0.00191	0.00194	0.00035	10,542							
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	44							
	SEQUENCE 3	6.0	6.0	96	38.8	35.2	3.6	6.0	5.5	0.6	0.00313	0.00303	0.00308	0.00056	9,814						
				97	38.7	35.1	3.6	6.0	5.4	0.6	0.00312	0.00303	0.00307	0.00055	9,804						
				98	38.6	34.9	3.6	6.0	5.4	0.6	0.00311	0.00303	0.00307	0.00055	9,771						
			99	38.7	35.1	3.5	6.0	5.4	0.5	0.00311	0.00303	0.00307	0.00055	9,821							
			100	38.6	35.1	3.5	6.0	5.4	0.5	0.00312	0.00304	0.00308	0.00056	9,788							
		COLUMN AVERAGE		38.7	35.1	3.6	6.0	5.4	0.6	0.00312	0.00303	0.00307	0.00055	9,800							
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	20							
SEQUENCE 4		6.0	8.0	96	51.0	46.1	4.9	7.9	7.1	0.8	0.00453	0.00446	0.00450	0.00081	8,795						
				97	50.8	45.9	4.9	7.9	7.1	0.8	0.00454	0.00445	0.00450	0.00081	8,767						
				98	51.0	46.1	4.9	7.9	7.1	0.8	0.00455	0.00445	0.00450	0.00081	8,792						
			99	51.0	46.1	4.9	7.9	7.1	0.8	0.00454	0.00446	0.00450	0.00081	8,803							
			100	50.9	46.0	4.9	7.9	7.1	0.8	0.00452	0.00445	0.00449	0.00081	8,793							
		COLUMN AVERAGE		50.9	46.0	4.9	7.9	7.1	0.8	0.00454	0.00446	0.00450	0.00081	8,790							
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	14							
	SEQUENCE 5	6.0	10.0	96	62.6	56.5	6.1	9.7	8.8	0.9	0.00612	0.00603	0.00608	0.00110	7,986						
				97	62.5	56.4	6.1	9.7	8.7	0.9	0.00612	0.00603	0.00608	0.00110	7,967						
				98	62.9	56.7	6.2	9.7	8.8	1.0	0.00611	0.00604	0.00607	0.00110	8,014						
			99	62.7	56.6	6.0	9.7	8.8	0.9	0.00611	0.00603	0.00607	0.00109	8,011							
			100	62.6	56.6	6.1	9.7	8.8	0.9	0.00611	0.00604	0.00607	0.00110	7,999							
		COLUMN AVERAGE		62.7	56.6	6.1	9.7	8.8	0.9	0.00611	0.00603	0.00607	0.00110	7,995							
		STANDARD DEV.		0.1	0.1	0.1	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	19							

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at +2% above opt.									
SEQUENCE 6	4.0	2.0	96	13.9	12.3	1.6	2.1	1.9	0.2	0.00107	0.00103	0.00105	0.00019	10,085							
	97	13.7	12.1	1.6	2.1	1.9	0.3	0.00108	0.00102	0.00105	0.00019	9,904									
	98	14.0	12.4	1.6	2.2	1.9	0.2	0.00107	0.00103	0.00105	0.00019	10,146									
	99	13.8	12.2	1.7	2.1	1.9	0.3	0.00106	0.00103	0.00105	0.00019	9,980									
	100	13.8	12.2	1.6	2.1	1.9	0.3	0.00106	0.00103	0.00105	0.00019	9,998									
	COLUMN AVERAGE		13.9	12.2	1.6	2.1	1.9	0.3	0.00107	0.00103	0.00105	0.00019	10,023								
	STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00000	0.00000	0.00000	95								
	SEQUENCE 7	4.0	4.0	96	26.1	23.8	2.3	4.0	3.7	0.4	0.00215	0.00208	0.00211	0.00038	9,663						
		97	26.1	23.8	2.3	4.0	3.7	0.4	0.00215	0.00209	0.00212	0.00038	9,634								
		98	26.3	23.9	2.3	4.1	3.7	0.4	0.00215	0.00208	0.00211	0.00038	9,725								
99		26.2	23.8	2.3	4.1	3.7	0.4	0.00215	0.00207	0.00211	0.00038	9,695									
100		26.0	23.7	2.3	4.0	3.7	0.4	0.00215	0.00208	0.00211	0.00038	9,641									
COLUMN AVERAGE		26.1	23.8	2.3	4.0	3.7	0.4	0.00215	0.00208	0.00211	0.00038	9,672									
STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	38									
SEQUENCE 8		4.0	6.0	96	38.5	35.0	3.5	6.0	5.4	0.5	0.00334	0.00327	0.00330	0.00060	9,085						
		97	38.6	35.0	3.6	6.0	5.4	0.6	0.00334	0.00326	0.00330	0.00060	9,114								
		98	38.7	35.3	3.4	6.0	5.5	0.5	0.00335	0.00326	0.00330	0.00060	9,175								
	99	38.4	34.9	3.6	6.0	5.4	0.6	0.00334	0.00325	0.00330	0.00059	9,084									
	100	38.7	35.2	3.5	6.0	5.5	0.5	0.00334	0.00327	0.00331	0.00060	9,149									
	COLUMN AVERAGE		38.6	35.1	3.5	6.0	5.4	0.5	0.00334	0.00326	0.00330	0.00060	9,121								
	STANDARD DEV.		0.1	0.2	0.1	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	40								
	SEQUENCE 9	4.0	8.0	96	50.9	46.1	4.8	7.9	7.1	0.7	0.00468	0.00461	0.00465	0.00084	8,512						
		97	50.9	46.2	4.7	7.9	7.1	0.7	0.00468	0.00461	0.00465	0.00084	8,526								
		98	50.9	46.1	4.8	7.9	7.1	0.7	0.00469	0.00462	0.00465	0.00084	8,505								
99		50.8	46.0	4.8	7.9	7.1	0.7	0.00468	0.00462	0.00465	0.00084	8,492									
100		50.8	46.1	4.7	7.9	7.1	0.7	0.00468	0.00461	0.00464	0.00084	8,514									
COLUMN AVERAGE		50.8	46.1	4.8	7.9	7.1	0.7	0.00468	0.00461	0.00465	0.00084	8,510									
STANDARD DEV.		0.1	0.1	0.1	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	13									

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at +2% above opt.									
SEQUENCE 10	4.0	10.0	96	62.9	56.8	6.1	9.7	8.8	0.9	0.00619	0.00612	0.00615	0.00111	7,923							
			97	62.9	56.8	6.1	9.7	8.8	0.9	0.00619	0.00612	0.00615	0.00111	7,923							
			98	62.9	56.8	6.1	9.7	8.8	0.9	0.00618	0.00611	0.00615	0.00111	7,928							
			99	62.8	56.8	6.1	9.7	8.8	0.9	0.00619	0.00612	0.00615	0.00111	7,920							
			100	63.0	56.9	6.0	9.7	8.8	0.9	0.00619	0.00611	0.00615	0.00111	7,949							
		COLUMN AVERAGE		62.9	56.8	6.1	9.7	8.8	0.9	0.00619	0.00611	0.00615	0.00111	7,928							
		STANDARD DEV.		0.0	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	12							
	SEQUENCE 11	2.0	2.0	96	14.2	12.2	2.0	2.2	1.9	0.3	0.00113	0.00110	0.00111	0.00020	9,406						
				97	14.2	12.3	2.0	2.2	1.9	0.3	0.00112	0.00110	0.00111	0.00020	9,468						
				98	14.2	12.2	2.0	2.2	1.9	0.3	0.00113	0.00110	0.00111	0.00020	9,400						
				99	14.2	12.3	2.0	2.2	1.9	0.3	0.00113	0.00109	0.00111	0.00020	9,470						
			100	14.2	12.2	2.0	2.2	1.9	0.3	0.00113	0.00110	0.00111	0.00020	9,412							
		COLUMN AVERAGE		14.2	12.2	2.0	2.2	1.9	0.3	0.00113	0.00110	0.00111	0.00020	9,431							
		STANDARD DEV.		0.0	0.0	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	35							
SEQUENCE 12		2.0	4.0	96	26.0	23.7	2.3	4.0	3.7	0.4	0.00230	0.00223	0.00226	0.00041	8,981						
				97	26.0	23.8	2.2	4.0	3.7	0.3	0.00230	0.00223	0.00227	0.00041	9,021						
				98	26.0	23.7	2.3	4.0	3.7	0.4	0.00230	0.00222	0.00226	0.00041	9,019						
				99	26.1	23.8	2.3	4.0	3.7	0.3	0.00230	0.00223	0.00226	0.00041	9,026						
			100	26.0	23.8	2.2	4.0	3.7	0.3	0.00229	0.00223	0.00226	0.00041	9,026							
		COLUMN AVERAGE		26.0	23.8	2.2	4.0	3.7	0.3	0.00230	0.00223	0.00226	0.00041	9,015							
		STANDARD DEV.		0.0	0.1	0.1	0.0	0.0	0.0	0.00000	0.00001	0.00000	0.00000	19							
	SEQUENCE 13	2.0	6.0	96	38.6	35.1	3.5	6.0	5.4	0.5	0.00354	0.00347	0.00350	0.00063	8,604						
				97	38.7	35.1	3.6	6.0	5.4	0.6	0.00354	0.00345	0.00350	0.00063	8,629						
				98	38.6	35.1	3.5	6.0	5.4	0.5	0.00354	0.00346	0.00350	0.00063	8,601						
				99	38.5	35.0	3.5	6.0	5.4	0.5	0.00353	0.00346	0.00350	0.00063	8,589						
			100	38.4	34.9	3.5	6.0	5.4	0.5	0.00353	0.00346	0.00349	0.00063	8,582							
		COLUMN AVERAGE		38.6	35.0	3.5	6.0	5.4	0.5	0.00354	0.00346	0.00350	0.00063	8,601							
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	18							

Project Name: East Pearl Street Rehabilitation		Identification Marks: CBR-1 (RB-3)										Material Source: CBR-1 (RB-3) at +2% above opt.			
SEQUENCE 14	2.0	8.0	96	50.9	46.1	4.8	7.9	7.1	0.7	0.00491	0.00483	0.00487	0.00088	8,119	
			97	50.9	46.1	4.8	7.9	7.1	0.7	0.00492	0.00484	0.00488	0.00088	8,112	
			98	50.9	46.1	4.8	7.9	7.1	0.7	0.00491	0.00483	0.00487	0.00088	8,123	
			99	50.8	45.9	4.9	7.9	7.1	0.8	0.00491	0.00484	0.00487	0.00088	8,090	
			100	50.6	45.9	4.7	7.8	7.1	0.7	0.00491	0.00483	0.00487	0.00088	8,092	
		COLUMN AVERAGE		50.8	46.0	4.8	7.9	7.1	0.7	0.00491	0.00483	0.00487	0.00088	8,107	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00000	0.00000	0.00000	0.00000	15	
	SEQUENCE 15	2.0	10.0	96	62.7	56.6	6.1	9.7	8.8	0.9	0.00640	0.00635	0.00638	0.00115	7,618
				97	62.6	56.5	6.1	9.7	8.8	0.9	0.00642	0.00635	0.00638	0.00115	7,602
				98	62.9	56.7	6.1	9.7	8.8	0.9	0.00641	0.00634	0.00638	0.00115	7,636
			99	63.0	56.9	6.0	9.7	8.8	0.9	0.00641	0.00636	0.00639	0.00115	7,653	
			100	62.9	56.9	6.0	9.7	8.8	0.9	0.00642	0.00635	0.00639	0.00115	7,642	
		COLUMN AVERAGE		62.8	56.7	6.1	9.7	8.8	0.9	0.00641	0.00635	0.00638	0.00115	7,630	
		STANDARD DEV.		0.1	0.2	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	21	

TESTED BY _____ RLB _____ DATE 08-05-2003

Boudreau Engineering, Inc.

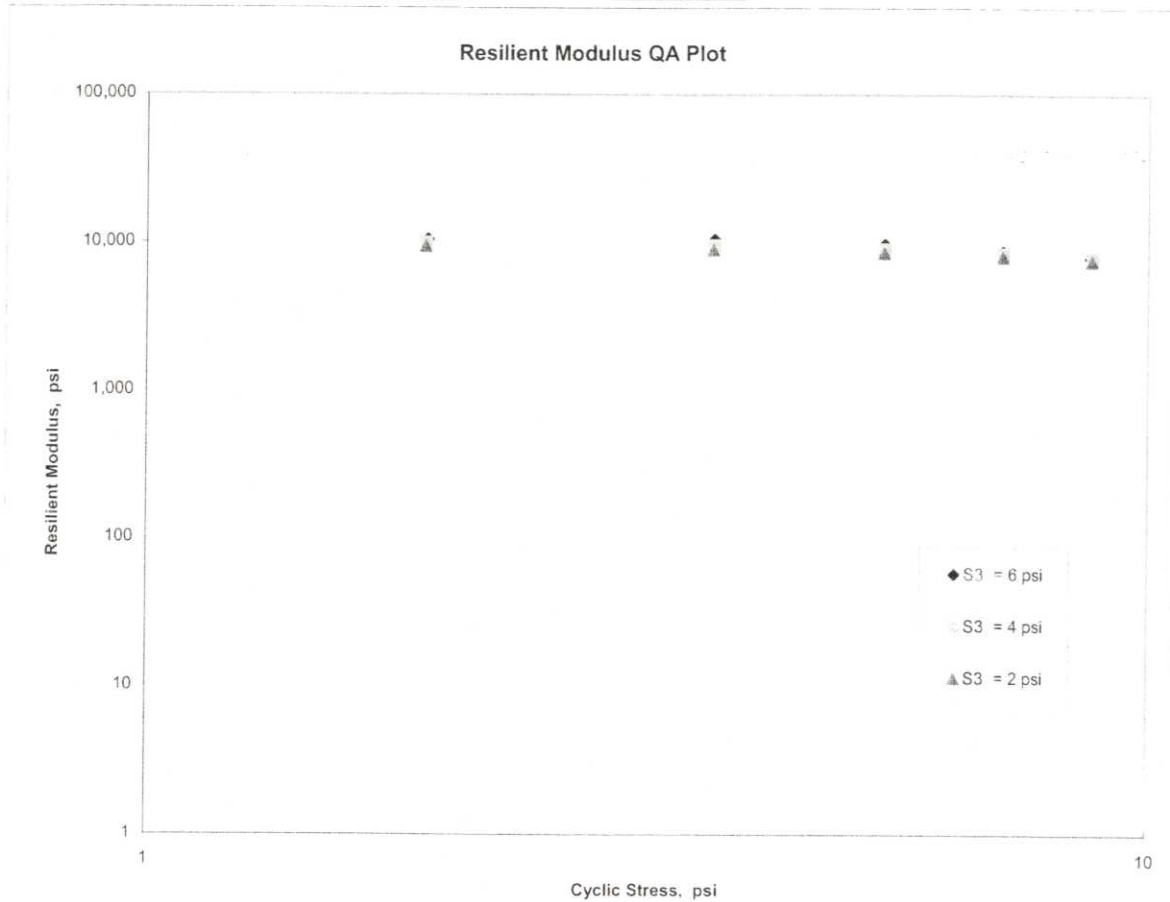
AASHTO T307-99

FIGURE 1 - Logarithmic Plot of Resilient Modulus (M_R) vs Cyclic Stress (S_C)

1. PROJECT NO(S):	<u>1-03-0557 (DES 10100667)</u>
2. PROJECT NAME:	<u>East Pearl Street Rehabilitation</u>
3. SOURCE OF MATERIAL:	<u>CBR-1 (RB-3) at +2% above opt.</u>
4. REMOLDING TARGETS:	<u>95% Maximum Dry Density at 16% Moisture Content</u>
5. LAYER TYPE (1 - subgrade, 2 - base/subbase)	<u>1</u>
6. MATERIAL TYPE (Type 1 or Type 2)	<u>2</u>
7. TEST DATE	<u>08-05-2003</u>

$$M_R = K_1 (S_C)^{K_2} (S_3)^{K_5}$$

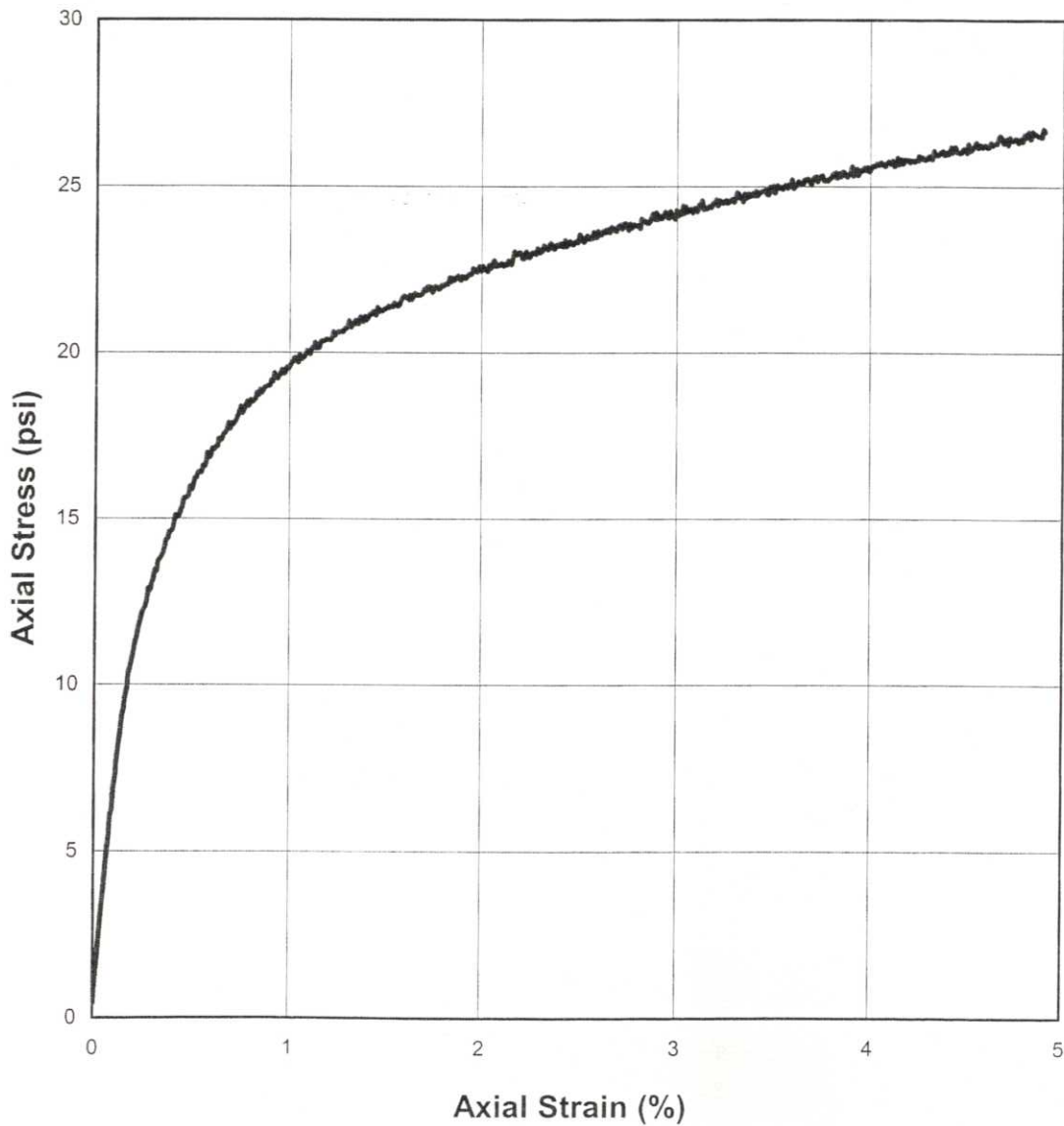
K1 =	<u>10.078</u>
K2 =	<u>-0.15064</u>
K5 =	<u>0.09388</u>
R2 =	<u>0.85</u>



AASHTO T307-99

FIGURE 2 - Quick Shear Stress vs Strain

1. PROJECT NO(S):	1-03-0557 (DES 10100667)
2. PROJECT NAME:	East Pearl Street Rehabilitation
3. SOURCE OF MATERIAL:	CBR-1 (RB-3) at +2% above opt.
4. REMOLDING TARGETS:	95% Maximum Dry Density at 16% Moisture Content
5. LAYER TYPE (1 - subgrade, 2 - base/subbase)	1
6. MATERIAL TYPE (Type 1 or Type 2)	2
7. TEST DATE	08-05-2003



APPENDIX C

Alternate Subgrade Treatment For Cut and At-Grade Sections

APPENDIX C

Alternate Subgrade Treatment for Cut and At-Grade Sections

In this urban setting, some reduction in construction interference with buried utilities may be achieved by a reduction in the amount of over-excavation. Thus, a suggested alternate procedure to the Type A treatment is as follows:

Six (6) inches of subgrade excavated, placement of one layer of geogrid in accordance with INDOT Specification 617, and replacement with coarse aggregate No. 53. If this subgrade treatment is utilized, the pavement design should be based on a CBR value of 2 percent (93 percent compaction).

This recommended procedure may be written on the plans as a Special Provision.