PRELIMINARY SUBSURFACE EVALUATION

EASTSIDE PARK
NOBLESVILLE, INDIANA

Prepared for

CONTEXT LANDSCAPE ARCHITECTURE
12 SOUTH MAIN STREET, SUITE 200
FORTVILLE, INDIANA 46040

By

EARTH EXPLORATION, INC.
7770 WEST NEW YORK STREET
INDIANAPOLIS, INDIANA 46214-2988

June 30, 2014

EARTH EXPLORATION INC.
7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1690 (FAX) 317-273-2250

2204 Yankee Street
Niles, MI 49120
269-262-4320 or 574-233-6820
(FAX) 269-262-4479

June 30, 2014

Attn: Mr. Brian McNerney, PLA, ASLA
CONTEXT Landscape Architecture
12 South Main Street, Suite 200
Fortville, IN 46040

Re: Preliminary Subsurface Evaluation
Eastside Park
Noblesville, Indiana
EEI Project No. 1-14-202

Dear Mr. McNerney:

We have completed our subsurface evaluation for the above-referenced project. This preliminary report presents the findings of our subsurface exploratory and laboratory testing programs and includes preliminary discussion of geotechnical-related items including foundation design and construction as well as earthwork aspects of site development. As you are aware, the work for this project was authorized by you on April 20, 2014, via acceptance of Earth Exploration, Inc. (EEI) Proposal No. P1-14-266.1. Considering the limited information available regarding the proposed development, this report should be considered preliminary in nature and for purposes of general site characterization of the subsurface soil profile, and evaluation of the feasibility of the construction of a park. Once additional information is available, we understand that EEI will be contacted to provide additional borings and provide additional recommendations and/or revise the recommendations provided herein, as necessary.

For your information, we are enclosing three copies of our report for your review and distribution and are providing an electronic copy. Unless you notify us otherwise, we will retain the soil samples from the exploratory program for 60 days and then discard them.

The opinions and discussion submitted in this report are based, in part, on our interpretation of the subsurface information revealed at the widely spaced exploratory locations as indicated on an attached plan. Understandably, this report does not reflect variations in subsurface conditions between or beyond the extent of the borings. Therefore, variations in these conditions can be expected, and fluctuation of the groundwater levels will occur with time. Other important limitations of this report are discussed in Appendix A.

PROJECT DESCRIPTION

From our understanding, representatives of the Noblesville Parks and Recreation Board are planning to construct a park on the east side of Noblesville. Based on information provided by CONTEXT Landscape Architecture (CONTEXT), the park site consists of about 201.4 ac located at the southwest corner of the intersection of 166th St. and Boden Rd. At the time of this report, the parcels consisted of unimproved land or agricultural fields. The park is planned to include park shelters, restroom buildings, various retaining wall types, a sledding hill, pre-engineered maintenance and salt storage buildings, multi-story buildings, bio-retention areas, ponds, grassland and forest restoration areas, general recreation areas, athletic fields, and pavement. Proposed grades were not available at the time of this report. However, based on telephone conversations with Mr. Brian McNearney with CONTEXT, it is anticipated that cuts and fills on the order of 10 ft may be necessary to achieve the proposed grade. At this time, no other information such as final element locations, structure types, foundation loads, or construction schedule is known.

SUBSURFACE EXPLORATORY PROGRAM AND LABORATORY TESTING

Subsurface conditions for the improvements were explored by performing 17 test borings (designated B-1 through B-17) to depths of 20 to 25½ ft below the existing ground surface at the locations shown on Drawing No. 1-14-202.B1 in Appendix C. It should be noted that the borings were planned to extend to depths of 20 to 30 ft. However, Borings B-2, B-4, B-13, B-14, and B-16 encountered auger refusal prior to achieving the planned depth. In addition to the test borings, temporary piezometers were installed at the locations of Borings B-1, B-2, B-4, B-5, B-7, B-9, B-10, B-12, B-13, B-14, B-15, and B-16 after the completion of the sampling activities for purposes of performing in-situ permeability testing. The piezometers were constructed in a separate borehole performed within 5 ft of the original test boring using 8 ft of 2 in. OD-PVC with slotted screen with about 2 ft of solid riser stick-up and were backfilled with clean silica sand. The number, depth and locations of the test borings were selected by CONTEXT. The boring locations were staked in the field by Miller Surveying, Inc. (Miller) on May 10, 2014. Ground surface elevations at the boring locations were also provided by Miller and are shown on the boring logs.

Exploratory activities were performed by EEI during the period of May 12 through May 20, 2014 using ATV-mounted equipment and hollow stem augers (3¼ in. I.D.) to advance the boreholes. Soil samples were obtained at 2½-ft intervals to a depth of 10 ft and at 5-ft intervals thereafter with a split-spoon sampler using Standard Penetration Test (SPT) procedures (ASTM D 1586). Further details of the drilling and sampling procedures are provided in Appendix B. Following completion of the field activities, final water level readings were obtained, and each borehole was backfilled with auger cuttings with a bentonite chip plug placed near the surface.

Following the field activities, the soil samples were visually classified by an EEI engineering technician and reviewed by a geotechnical engineer. Soil classifications on the boring logs are according to the Unified Soil Classification System (ASTM D 2488), and details of the classification system are provided in Appendix C. After classifying the samples, index property tests were performed on representative samples including: natural moisture content (W%; ASTM D 2216), Atterberg limits (LL, PL, PI - ASTM D 4318), and hand penetrometer readings (q_p; which provides an indication of the shear strength characteristics of cohesive-type soils only). Laboratory testing also included unconfined compression tests (q_u; ASTM D 2166) on select cohesive soil samples. Boring logs were then prepared and are attached in Appendix C. Results of the laboratory tests are included on the boring logs and/or on laboratory report sheets. The boring logs represent our interpretation of the individual samples, field logs and the results of the laboratory testing.

Stratification lines on the boring logs represent the approximate boundary between soil types; although the transitions may actually be gradual.

Percolation tests were performed at the installed piezometers. To perform the test, a water source was used to charge (fill) the piezometer, and the fall in water column height was monitored for a minimum of 3 hrs. After the completion of these tests, the piezometers were removed and the boreholes backfilled as previously discussed.

SITE CONDITIONS

Surface Conditions

Based on observations made during our exploratory field activities, the ground surface is rolling, but generally slopes down towards Lehr Ditch which runs in a northeasterly/southwesterly direction near the middle of the site. It is estimated there is about 35 ft of relief across the project area with grades ranging from El 795.4 to 829.3 at the test boring locations. The ground surface is mostly grass with some trees. Also, a portion of the eastern half of the site was undergoing tilling activities for agriculture during the percolation testing. Approximately 8 to 10 in. of topsoil was observed at the boring locations. Drainage is over the ground surface towards Lehn Ditch. It is not known if there are field tiles present.

Subsurface Conditions

Underlying the surface conditions, the soil profile generally consisted of lean clay underlain by silty clay to depths ranging from 3½ to 23 ft. The cohesive soils were, in turn, underlain by granular soils (sand and gravel, silty sand, clayey sand, fine to medium sand and silt) that generally extended to the maximum depth explored. However, it was not uncommon for interbedded layers of silty clay to be observed within the granular soils below a depth of 10 ft. Silty and clayey sand were observed at the locations of Borings B-6 and B-16 below the surface conditions.

The consistency of the lean clay was typically medium stiff to very stiff with hand penetrometer readings generally ranging from ¾ to 3¾ tons/sq. ft (tsf), and moisture contents were on the order of 20 to 27 percent. Unconfined compression tests performed on split-spoon samples of the lean clay indicated peak undrained shear strengths (i.e. using the Ø=0 concept) in the range of 1.43 to 1.74 ksf at axial strains of 9 to 15 percent. Atterberg limit determinations performed on samples of the lean clay indicate the liquid limit (LL) for the lean clay ranges from 24 to 44 percent with the plasticity index (PI) ranging from 9 to 27 percent. The consistency of the silty clay was generally stiff to hard with hand penetrometer readings ranging from less than 1½ to more than 4½ tsf, and moisture contents were typically in the range of 8 to 15 percent. In addition, unconfined compression tests performed on split-spoon samples of the silty clay indicated peak undrained shear strengths of about 2.12 to 6.68 ksf at axial strains of 6 to 10 percent. Results of an Atterberg limit determination performed on a sample of silty clay indicated a LL of 20 percent with a PI of 7 percent. Based on a comparison of the moisture content and Atterberg limit results, the silty clay is generally anticipated to be overconsolidated.

The relative density of the granular soils was typically loose to medium dense based on N-values ranging from 5 to 20 blows/ft (bpf) in the upper 6 ft, and medium dense to very dense below a depth of 6 ft based on N-values ranging from 13 to 36 bpf.

As previously mentioned auger was observed at several boring locations. Considering that a limestone quarry is located about ½ mi north of the site, it is anticipated that auger refusal was on limestone bedrock. The table below summarizes the depths and elevations that auger refusal was observed at each respective location.

Table 1: Depth and Elevation Auger Refusal

Boring	Surface El.	Depth to Auger Refusal (ft)	Auger Refusal El. (ft)
B-2	797.01	24.5	772.5
B-4	797.25	25.5	771.8
B-13	797.05	22	775.1
B-14	806.12	23.5	782.6
B-16	795.35	18.5	776.9

The results of the percolation tests are provided in the table below. Testing at the location of Borings B-7 and B-15 were unsuccessful due to the piezometer pipe being destroyed during farming activities.

Table 2: Percolation Test Results

Boring	Percolation Rate (cm/s)
B-1	10^{-5}
B-2	10^{-5}
B-4	10^{-4}
B-5	10^{-5}
B-9	10^{-6}
B-10	10^{-4}
B-12	10^{-5}
B-13	10^{-5}
B-14	10^{-4}
B-16	10^{-7}

Groundwater Conditions

Groundwater level observations made during and up to 24 hrs after the completion of the sampling process are noted at the bottom of the boring logs. From our observations, groundwater was typically observed at depths ranging from 2½ to 8½ ft corresponding to elevations between El. 788.5 and 823.5. In our opinion, these levels may represent a perched condition and the actual "piezometric" groundwater level is deeper than the maximum depth explored at most of the boring locations. This is also consistent with generalized information published in a reference titled *Hydrogeologic Atlas of Aquifers in Indiana* (U.S. Geological Survey, Water-Resources

Investigations Report 92-4142) which indicates that the groundwater level in this area is typically at the soil and bedrock interface. As additional input, a review of the *Soil Survey of Hamilton County* indicated that the project area is also prone to a seasonal high groundwater level (i.e., perched) within 1 to 3 ft of the ground surface, particularly during the wet periods of the year. It should also be noted that fluctuation of these levels, either perched or piezometric, can occur due to changes in precipitation, infiltration, run-off, changes in the pumping rates of nearby wells and other hydrogeological factors.

DISCUSSION AND RECOMMENDATIONS

General

Based on the information obtained at the test boring locations and the limited project details, it is our opinion that the subsurface conditions are generally conducive for the development of a park and construction of the proposed park elements. Considering the moisture-sensitive nature of the shallow cohesive soils, proper site preparation will be essential in order to provide adequate support of the proposed elements.

As previously mentioned, the project was in a conceptual design phase at the time of this report. Final element locations, foundation loads, and the grading plan were not available. These items will have a significant impact on the geotechnical recommendations for these proposed structures. Considering this, the following is a preliminary discussion of geotechnical-related items. It is recommended that EEI be retained as development progresses and work with the design engineers to address the many planned elements at this site. As plans progress, additional test borings will be necessary to provide recommendations for the proposed structures and pavements.

Subgrade Preparation

As the initial step in preparing the site, it is typical to remove all topsoil within the limits of proposed structures or fills. In our opinion, these activities should extend a minimum of 5 ft beyond the limits of the proposed construction where feasible. Variations in the topsoil thickness should be anticipated but was generally observed to range from 8 to 12 in. at the boring locations. This material may be stockpiled for use in green areas. To reduce the risk of softening of the near-surface soils especially when exposed to excessive moisture, we recommend that proper site drainage be provided at the time of construction. This includes avoiding leaving depressions in grubbing areas that may collect water. Additionally, we recommend that known or encountered field tiles be provided perpetuation where possible and removed from below building and foundation areas. Furtheromre, to reduce the risk of widespread subgrade softening/exposure, it is common to only perform clearing activities only in those areas which will be immediately developed.

The above-mentioned clearing activities are anticipated to expose medium stiff to stiff lean clays. However, granular soils (silt and clayey sand) were observed near the surface which will be immediately developed at the locations of Borings B-6 and B-16 underlying the surface conditions. These borings were located in the north-central portion of the site. Although these soils were described as granular-type soils, they contain a significant amount of fine soil (silt and clay) particles and are anticipated to behave like a cohesive-type soil with regards to moisture sensitivity. Following the above-mentioned activities, we recommend that the subgrade soil be proof-rolled with a heavy rubber-tired vehicle (where feasible). The purpose of proof-rolling is to provide a first-order evaluation of how the subgrade is anticipated to react to construction traffic (e.g., during fill placement) and gain an additional understanding of how the subgrade will behave following construction. We also recommend that EEI be retained during earthwork activities. Although generally observed to be stiff based on hand penetrometer readings, these soils are moisture-sensitive, and soft (yielding) areas are anticipated to be prevalent across the site. Where yielding subgrade areas are encountered, improvement alternatives could consist of conventional aeration and recompaction, undercut and replacement, or chemical modification. While aeration and recompaction may be the most economical improvement alternative, it requires favorable weather conditions and additional time for construction. Therefore, undercutting and replacement with granular soil or moisture-conditioned cohesive soil (possibly in conjunction with high tensile modulus bi-axial geogrid) or chemical modification of the in-situ soil using lime, kiln dust, or a combination thereof (to be determined by a specialty contractor) could be considered. In general, smaller yielding subgrade areas could be improved by removal and replacement of the existing soils. For larger areas, chemical modification is typically more conducive. Additionally, chemical modification would, in our opinion, provide a solid working platform necessary for the placement of the proposed fills, which is critical to the performance of the fill. The final decision regarding subgrade improvement should be made at the time of construction based on the observed actual conditions. For budgetary purposes, we recommend that consideration be given to chemical modification below proposed drive and parking areas as well as structure areas and areas where fill is intended to be placed.

Earthwork Considerations

It is recommended that consideration be given to grading the site to promote proper drainage to prevent the subgrade soils from becoming inundated (such that an increase in moisture content will result, i.e., causing a decrease in the strength and increase in deformational characteristics). Due to the sensitive nature of the fine-grained soils anticipated at the site, travel on the subgrades with construction equipment should be minimized. The construction of drainage systems early in the project schedule will assist with the removal of water from the site and with maintaining the integrity of prepared subgrades.

Generally, cohesive soils were encountered at a shallow depth and, in our opinion, these soils are suitable for reuse as engineered fill. Refer to the General Specification No. 1 in Appendix D for general recommendations regarding fill placement. Additionally, the natural moisture content of these soils may be in excess of the optimum moisture content and will require conditioning prior to obtaining adequate compaction. Conditioning is typically accomplished by continuously discing of the soils to reduce the moisture content and breakdown soil clods. Periodic density measurements by EEI are typically utilized to evaluate the adequacy of the compaction activities.

With regards to the bio-retention and planned slope areas (i.e., the sledding hill), side-slopes established at 2H:1V and flatter generally do not present a concern with regards to <u>global</u> stability. However, slopes established at 2H:1V and steeper are susceptible to surficial sloughing and create maintenance issues due to difficulty for equipment access. Therefore, it will be critical to the performance of these areas that erosion control at the face of the slopes be established as soon as possible after the grading activities are complete.

Foundation Design Considerations

The building locations, layouts, and loads were not available for review at this time. However, the observed soil conditions generally appear conducive for the construction of conventional spread foundations. It is anticipated that allowable bearing pressures in the range of 1,500 to 4,000 psf could be possible at this site. The recommended bearing capacity will be dependent on the strength of the bearing strata, the type of foundation utilized, and the foundation loads. As previously mentioned, additional soil borings will be necessary to confirm the subsurface conditions at the proposed structures once the proposed locations and grades are known.

Retaining Wall Considerations

The wall locations, heights, and types were not available for review at this time. Based on the conceptual plan provided by CONTEXT, a retaining wall is planned in the vicinity of Boring B-11. The soils observed at this location consisted of cohesive soils. These types of soils are not free-draining. Thus, it is typical for walls constructed in cohesive soils to be provided with a granular drainage course placed immediately behind the wall to facilitate drainage. The lateral earth pressures acting on the walls will be dependent on the type of wall constructed, the height of the walls, drainage provisions, wall backfill, and surcharges from structures or traffic.

Seismic Considerations

Subsurface conditions were generally observed to consists of stiff cohesive soils and medium dense granular soils underlain by probable bedrock at depths ranging from about 19 ft to more than 30 ft. Based on the soil descriptions provided in Table 1613.5.2 of the 2006 International Building Code (IBC), it is our opinion that Site Class D should be used for design. Spectral response values of 0.169 and 0.076 for S_S and S_1, respectively, may also be utilized for design.

Slab-on-Grade Considerations

Provided the subgrade areas are prepared in accordance with the previous recommendations, the observed subsurface conditions appear conducive for the construction of slabs-on-grade. In general, it is recommended that floor slabs be constructed on a minimum of 6 in. of free-draining granular material. Suitable clean, free-draining soil should contain no more than 5 percent fines, by weight, passing the No. 200 U.S. Standard sieve. Additional recommendations for the design and construction of floor slabs can be provided once the aforementioned information and additional test borings are performed.

Pavement Design Considerations

We anticipate that pavement subgrades will consist of naturally-occurring cohesive soils or engineered fill similar to those soils conditions observed at the exploratory locations. Over time, the cohesive soils are considered to present a poor subgrade condition due to their frost susceptibility and tendency to lose strength when wet. Particular attention to subgrade preparation, control of subsurface drainage and periodic preventative maintenance are critical to the design life of any pavement section. In our opinion, the final pavement design should also incorporate adequate surface and subsurface drainage as discussed earlier. Based on our experience, the near-surface lean clay typically results in a California Bearing Ratio (CBR) value in the range of 3 to 5. If reqested, additional testing could be performed to develop additional pavement recommendations.

Pond Considerations

The final pond extents, bottom of pond elevation, and normal pool elevation was not known at the time of this report. Boring B-2 was performed in the vicinity of the proposed pond enlargement area. The soil profile in this boring consisted of cohesive soils to a depth of 24 ft with sand seams noted near a depth of 20 ft. However, a majority of the soil borings performed across the site encountered granular soil layers at shallower depths. If these granular layers are encountered during construction of the pond, significant construction difficulties associated with dewatering and bank stability should be anticipated. If ponds are desired to function as a sealed system, it may be advantageous to consider the use of a cohesive liner. It is anticipated that the lean clay observed at a shallow depth across the site may be suitable for this purpose. It is recommended that EEI be retained to determine the suitability of this material for use as a liner. The liner thickness will be dependent of the permeability of the soil as tested in our laboratory.

Construction Considerations

Because cohesive subgrade soils tend to soften when exposed to water, surface run-off should be diverted from the excavations and ponding of water from rainfall should be minimized. Due to the sensitive nature of the fine-grained soils anticipated at the site, travel on the foundation subgrades with construction equipment, apart from proof-rolling, should be minimized. If areas of the subgrade become disturbed, or begin to "pump," they should be undercut and replaced with compacted crushed aggregate. To minimize general deterioration of the subgrade soils, appropriate construction sequencing of earthwork and concrete placement activities are recommended. In the event that earthwork and foundation construction activities begin during the winter, we recommend that foundation subgrades be protected from freezing until concrete is poured and backfilling is completed. In addition, no fill or backfill should be placed in a frozen condition.

Dewatering at the site will be a function of the proposed grades. As previously discussed, the subsurface conditions generally consisted of cohesive soils with granular seams and layers. Where shallow excavations are planned in the cohesive soils and thin granular seams are encountered, dewatering for this can typically be accomplished via a pump and filtered sump, possibly in combination with collection trenches. If excavations extend into the underlying wet granular soil layers, a more robust dewatering system will likely be necessary to control groundwater infiltration. The best-suited dewatering system for this scenario would be dependent on the type of construction and the soils observed but may require well points or slotted casing and large volume pumps.

Based on our observations, the cohesive soils encountered at the boring locations are classified as Type B in accordance with OSHA standards (i.e., 29 CFR Part 1926). The observed granular soils may be considered Type C soils, provided they are dewatered prior to excavation.

CONCLUDING REMARKS

In closing, we recommend that EEI be contacted when additional information is available to provide more specific recommendations. We also recommend that EEI be retained to review the aforementioned design details, and to provide construction monitoring services during the foundation construction and earthwork phases of the project. This will allow us to verify that the construction proceeds in compliance with the design concepts, specifications and recommendations. It will also allow design changes to be made in the event that subsurface conditions differ from those anticipated.

We appreciate the opportunity to provide our services to you. If you have any questions regarding this information or require further assistance with the project, please feel free to contact us.

Sincerely,

EARTH EXPLORATION, INC.

Kellen P. Heavin, P.E.
Senior Geotechnical Engineer

Scott T. Roosa, P.E.
Senior Geotechnical Engineer

KELLEN PATRICK HEAVIN
REGISTERED
PE11011658
STATE OF INDIANA
PROFESSIONAL ENGINEER

Attachments:

Appendix A -	Important Information about your Geotechnical Engineering Report
Appendix B -	Field Methods for Exploration and Sampling Soils and Rock
Appendix C -	Test Boring Location Plan (Drawing No. 1-14-202.A1)
	Unified Soil Classification System/General Notes
	Log of Test Boring (17)
	Unconfined Compression Test (4)
Appendix D -	General Specification No. 1

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one—not even you*—should apply the report for any purpose or project except the one originally contemplated.

Read the full report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions *only* at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an *opinion* about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject To Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations", many of these provisions indicate where geotechnical engineers responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE

8811 Colesville Road Suite G106 Silver Spring, MD 20910

Telephone: 301-565-2733 Facsimile: 301-589-2017

email: info@asfe.org www.asfe.org

APPENDIX B

FIELD METHODS FOR EXPLORATION AND SAMPLING SOILS AND ROCK

FIELD METHODS FOR EXPLORING AND SAMPLING SOILS AND ROCK

A. Boring Procedures Between Samples

The boring is extended downward, between samples, by a hollow stem auger, continuous flight auger, driven and washed-out casing, or rotary boring with drilling mud or water.

B. Standard Penetration Test and Split-Barrel Sampling of Soils
(ASTM* Designation: D 1586)

This method consists of driving a 2-in. outside diameter split-barrel sampler using a 140-lb weight falling freely through a distance of 30 in. The sampler is first seated 6 in. into the material to be sampled and then driven 12 in. The number of blows required to drive the sampler the final 12 in. is recorded on the Log of Test Boring and known as the Standard Penetration Resistance or N-value. Recovered samples are first classified as to texture by the field personnel. Later in the laboratory, the field classification is reviewed by a geotechnical engineer who observes each sample.

C. Thin-walled Tube Sampling of Soils
(ASTM* Designation: D 1587)

This method consists of hydraulically pushing a 2-in. or 3-in. outside diameter thin wall tube into the soil, usually cohesive types. Relatively undisturbed samples are recovered.

D. Soil Investigation and Sampling by Auger Borings
(ASTM* Designation: D 1452)

This method consists of augering a hole and removing representative soil samples from the auger flight or bucket at 5-ft intervals or with each change in the substrata. Relatively disturbed samples are obtained and its use is therefore limited to situations where it is satisfactory to determine approximate subsurface profile.

E. Diamond Core Drilling for Site Investigation
(ASTM* Designation: D 2113)

This method consists of advancing a hole in rock or other hard strata by rotating downward a single tube or double tube core barrel equipped with a cutting bit. Diamond, tungsten carbide, or other cutting agents may be used for the bit. Wash water is used to remove the cuttings. Normally, a 3-in. outside diameter by 2-in. inside diameter coring bit is used unless otherwise noted. The rock or hard material recovered within the core barrel is examined in the field and laboratory. Cores are stored in partitioned boxes and the length of recovered material is expressed as a percentage of the actual distance penetrated.

* American Society for Testing and Materials, Philadelphia, PA

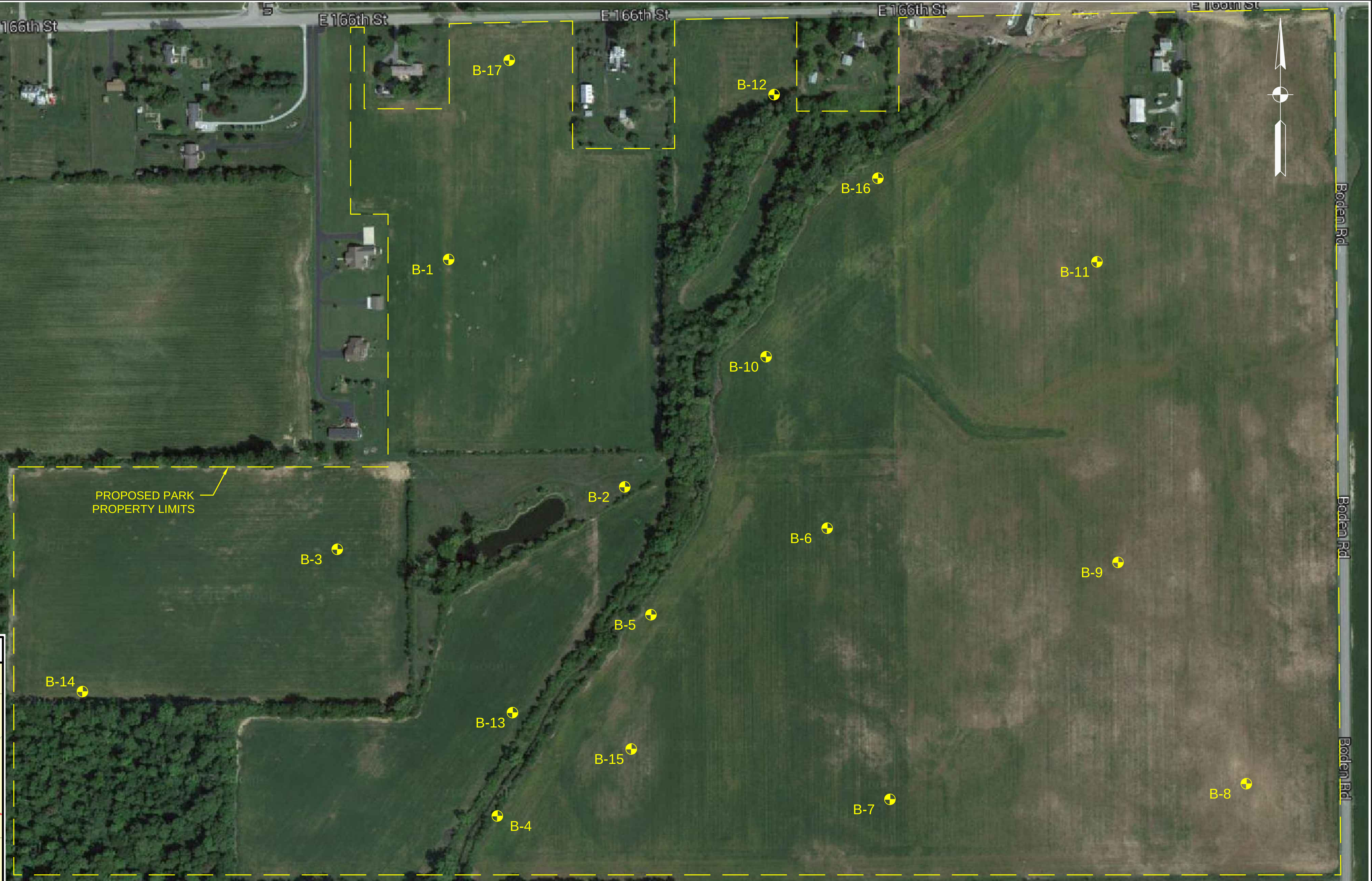
APPENDIX C

TEST BORING LOCATION PLAN
(Drawing No. 1-14-202.B1)

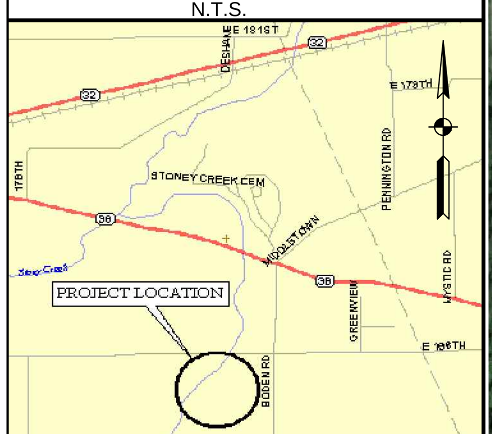
UNIFIED SOIL CLASSIFICATION SYSTEM/GENERAL NOTES

LOG OF TEST BORING (17)

UNCONFINED COMPRESSION TEST (4)



VICINITY MAP
N.T.S.



LEGEND

B-1 ⊕ Test Boring Location and Designation

NOTES

1. Base map developed from an aerial image from maps.google.com.
2. Vicinity map generated using commercially-available software by DeLorme (Street Atlas USA ver. 7.0).
3. Refer to the Log of Test Boring (17) in Appendix C for a description of the subsurface conditions encountered at the test boring locations.
4. Borings were located in the field by Miller Surveying, Inc. on May 10, 2014.
5. Ground surface elevations at the test boring locations were provided by Miller Surveying, Inc.

TEST BORING LOCATION PLAN

PROJECT:	Eastside Park
LOCATION:	Noblesville, Indiana
CLIENT:	CONTEXT Landscape Architecture
EEI PROJECT NO.:	1-14-202
SCALE:	1" = 300'

PROJECT ENG:	KPH
APPROVED BY:	STR
DRAWN BY:	JBF
DATE AND TIME:	6/9/14
DRAWING NO.:	1-14-202.B1

Earth Exploration
7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1690
(FAX) 317-273-2250

UNIFIED SOIL CLASSIFICATION SYSTEM / GENERAL NOTES

FINE-GRAINED SOILS

CONSISTENCY	UNCONFINED STRENGTH (tsf)
Very Soft	<0.25
Soft	0.25 - 0.5
Medium	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	>4.0

COARSE-GRAINED SOILS

RELATIVE DENSITY	N-VALUE* (Blows/ft)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50+

RELATIVE PROPORTIONS

TERM	DEFINING RANGE BY % OF WEIGHT
Trace	0 - 5
Little	5 - 12
Some	12 - 35
And	35 - 50

ORGANIC CONTENT BY COMBUSTION METHOD

SOIL DESCRIPTION	LOI
Trace Organic Matter	0 - 5%
Little Organic Matter	5 - 12%
Organic Silt/Clay	12 - 35%
Sedimentary Peat	35 - 50%
Fibrous and Woody Peat	50%±

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material coarser than No. 200 sieve	GRAVEL AND GRAVELLY SOILS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Little or no fines	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES Appreciable amount of fines	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS More than 50% of coarse fraction passing No. 4 sieve	CLEAN SANDS Little or no fines	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES Appreciable amount of fines	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS More than 50% of material finer than No. 200 sieve	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SAND OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

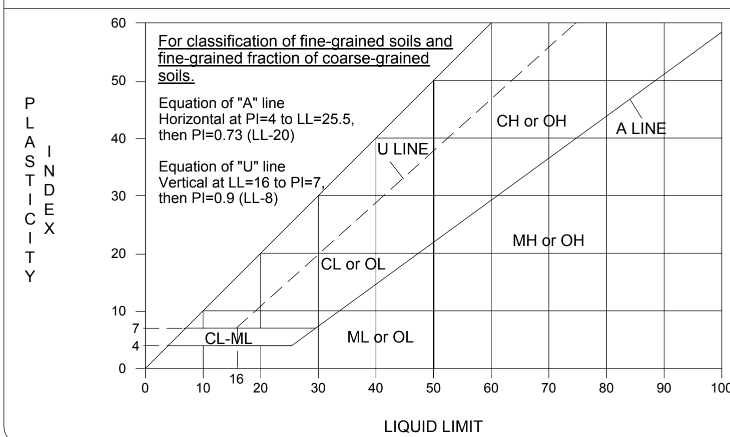
NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS

GRAIN SIZE TERMINOLOGY

SOIL FRACTION		PARTICLE SIZE	US STANDARD SIEVE SIZE
Boulders		Larger than 12-in.	Larger than 12-in.
Cobbles		3 to 12-in.	3 to 12-in.
Gravel	Coarse	3/4 to 3-in.	3/4 to 3-in.
	Fine	4.75 mm to 3/4-in.	#4 to 3/4-in.
Sand	Coarse	2.00 to 4.75 mm	#10 to #4
	Med	0.425 to 2.00 mm	#40 to #10
	Fine	0.075 to 0.425 mm	#200 to #40
Silt		0.005 to 0.075 mm	Smaller than #200
Clay		Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

PLASTICITY CHART



EXPLORATORY SAMPLING ABBREVIATIONS

AS	- Auger Sample
BF	- Backfilled Upon Completion
BS	- Bag Sample
C	- Casing: Size 2½-in., NW; 4-in., HW
COA	- Clean-Out Auger
CS	- Continuous Sampler
CW	- Clear Water
DC	- Driven Casing
DM	- Drilling Mud
FA	- Flight Auger
FT	- Fish Tail
HA	- Hand Auger
HSA	- Hollow Stem Auger
NW	- No Water Encountered
PID	- Photo-Ionization Detector
PMT	- Borehole Pressuremeter Test
PT	- 3-in. O.D. Piston Sample
PTS	- Peat Sample
RB	- Rock Bit
RC	- Rock Core
REC	- Recovery
RQD	- Rock Quality Designation
RS	- Rock Sounding
S	- Soil Sounding
SS	- 2-in. O.D. Split-Spoon Sample
ST	- Thin-Walled Tube Sample
VS	- Vane Shear Test
WPT	- Water Pressure Test

LABORATORY TEST ABBREVIATIONS

qp	- Hand Penetrometer Reading, tsf
qu	- Unconfined Compressive Strength, tsf
W	- Moisture Content, %
LL	- Liquid Limit, %
PL	- Plastic Limit, %
PI	- Plasticity Index, %
SL	- Shrinkage Limit, %
LOI	- Loss on Ignition, %
γ_d	- Dry Unit Weight, pcf
pH	- Hydrogen-Ion Concentration
P_{200}	- Percent Passing a No. 200 Sieve

*The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" O.D. split-spoon sampler. The sampler is driven with a 140 lb weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

LOG OF TEST BORING

EARTH EXPLORATION INC

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.	B-1
Elevation	803.49
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	80° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		15	7		**CL**, **LEAN CLAY**, little sand, stiff, brown, with wet silt seam near 7½'	1.0			22.3			
SS-2		35	9	800 / 5		1.5			22.2			
SS-3		65	2		**CL-ML**, **SILTY CLAY**, little sand and gravel, stiff to hard, gray, with sand seams	1.5			13.1			
SS-4		65	23	795 / 10		1.75			14.4			
SS-5		100	28	790 / 15	**SP**, **SAND AND GRAVEL**, medium dense, wet, gray	>4.5			11.1			
SS-6		65	20	785 / 20								

End of Boring at 20 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	After Drilling
To Water	7	4	BF
To Cave-in		19	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/20/14 End 5/20/14 Rig D120 ATV

Drilling Method 3¼" I.D. HSA

Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.	B-2
Elevation	797.07
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

Proj. No.	---	Station	---	Weather	Cloudy	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	75° F	Inspector	---

SAMPLE					DESCRIPTION/CLASSIFICATION and REMARKS	SOIL PROPERTIES						
No.	Type	Rec %	N Value	Depth ft / Elev		q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		65	7	795	**CL**, **LEAN CLAY**, stiff, gray	1.5			23.3			
SS-2		65	8	5		1.0			19.1			
SS-3		65	26	790	**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff to hard, gray, with sand seams near 20'	>4.5			8.8			
SS-4		90	26	10 / 785		>4.5			9.2			
SS-5		65	27	15 / 780		2.75			9.4			
SS-6		90	31	20 / 775		>4.5			8.6			
SS-7		100	50/.3		**SP**, **SAND AND GRAVEL**, very dense, wet, gray, possible cobble or boulder near 24'							

End of Boring at 24.3 ft

Auger refusal at 24.3 ft.
Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	24 hrs After Drilling
To Water	10	8	7
To Cave-in		---	10

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/20/14 End 5/20/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. B-3
Elevation 804.57
Datum NAVD 88
EEI Proj. No. 1-14-202
Sheet 1 of 1

Proj. No. ---	Station ---	Weather Sunny	Driller J.S.
Struct. No. ---	Offset ---	Temp. 80° F	Inspector ---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1		35	9			**CL**, **LEAN CLAY**, very stiff, brown	3.75			20.9	35	15	20
SS-2		65	5	5	800	**SC-SM**, **CLAYEY SAND**, very loose, wet, brown							
SS-3		65	9	▽		**CL-ML**, **SILTY CLAY**, trace sand, soft to stiff, brown, with wet sand seams near 15'	2.5	2.12	122.9	14.0			
SS-4		35	4	10 ▼	795		1.5			16.2			
SS-5		65	45	15	790		0.5			17.2			
SS-6		65	15	20	785	**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff, gray	>4.5			11.9			

End of Boring at 20 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	After Drilling
To Water	7	10	BF
To Cave-in		17	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/20/14 End 5/20/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture
Boring No.	B-4
Elevation	797.25
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

EARTH EXPLORATION, LLC
7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Proj. No.	---	Station	---	Weather	Partly Cloudy	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	80° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1	X	65	10	795	**CL**, **LEAN CLAY**, stiff, brown	2.0			26.7			
SS-2	X	35	9	5	**CL**, **LEAN CLAY**, little sand and gravel, very stiff, brown, with wet sand seams near 5'	3.0			17.8			
SS-3	X	65	26	790	**SP**, **SAND AND GRAVEL**, medium dense to dense, wet, brown							
SS-4	X	35	34	10								
				785								
SS-5	X	0	22	15								
				780								
SS-6	X	65	17	20	**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff, gray	3.25			11.8			
				775								
SS-7	X	65	50/.3	25	**SP**, **SAND AND GRAVEL**, very dense, wet, gray (visual)	---			---			

End of Boring at 25.5 ft

Auger refusal at 25.5 ft.
Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	24 hrs After Drilling
To Water	7	6	2
To Cave-in		17	5

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/12/14 End 5/12/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION, LLC

Project: **Eastside Park**
Location: **Noblesville, Indiana**
Client: **CONTEXT Landscape Architecture**

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. **B-5**
Elevation **797.05**
Datum **NAVD 88**
EEI Proj. No. **1-14-202**
Sheet **1** of **1**

Proj. No.	---	Station	---	Weather	Cloudy	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	80° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1		100	10		795	**CL**, **LEAN CLAY**, trace sand, stiff, gray	1.25			21.3			
SS-2		95	6	5			---			---			
				▼		**SM**, **SILTY SAND**, loose, wet, gray							
SS-3		65	9		790		2.5			11.0			
SS-4		65	12	10	785	**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff, brownish gray to gray below 8'	3.25			12.9			
AS-1		0	25	▽ 15	780		---			9.5			
SS-5		45	23	20	775	**SM**, **SILTY SAND**, medium dense, wet, brown							
SS-6		65	47	25		**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff, gray, with wet sand seams	2.75			9.6			

End of Boring at 25 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	24 hrs After Drilling
To Water	14	6	NW
To Cave-in		14½	4

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start **5/12/14** End **5/12/14** Rig **D120 ATV**
Drilling Method **3¼" I.D. HSA**
Remarks **Backfilled with auger cuttings and bentonite chip plug near surface.**

LOG OF TEST BORING

EARTH EXPLORATION, LLC

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.	B-6
Elevation	799.95
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	70° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1		65	11										
SS-2		100	12	5	795	ML, SILT, medium dense, moist to wet below 4', brown							
SS-3		65	20										
SS-4		100	18	10	790	CL-ML, SILTY CLAY, little sand and gravel, hard, gray	>4.5			12.7			
SS-5		100	18	15	785		---			---			
SS-6		100	24	20	780	SP, SAND AND GRAVEL, medium dense, wet, gray, with clay seam near 20'							
SS-7		100	26	25	775								

End of Boring at 25 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	24 hrs After Drilling
To Water	14	4	3½
To Cave-in		23	5

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/19/14 End 5/19/14 Rig D120 ATV

Drilling Method 3¼" I.D. HSA

Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.	B-7
Elevation	805.1
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	50° F	Inspector	---

SAMPLE					DESCRIPTION/CLASSIFICATION and REMARKS	SOIL PROPERTIES						
No.	Type	Rec %	N Value	Depth ft / Elev		q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
				0 – 0.5	**TOPSOIL**							
SS-1		65	5		**CL**, **LEAN CLAY**, trace sand, medium stiff to hard, brown	1.5			16.3	24	15	9
SS-2		65	5	5 / 800		0.75			25.5			
SS-3		100	14			>4.5			18.6			
SS-4		65	16	10 / 795		>4.5			19.9			
SS-5		100	14	15 / 790	**SP**, **FINE TO MEDIUM SAND**, medium dense, wet, brown	---			---			
SS-6		100	12	20	**CL-ML**, **SILTY CLAY**, very stiff, brown	2.75			9.6			

End of Boring at 20 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	24 hrs After Drilling
To Water	14	2	2½
To Cave-in		18	4

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/19/14 End 5/19/14 Rig D120 ATV

Drilling Method 3¼" I.D. HSA

Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC
7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

Boring No.: B-8
Elevation: 829.33
Datum: NAVD 88
EEI Proj. No.: 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	49° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1	X	65	6				>4.5			10.9			
SS-2	X	100	16		825		4.25			12.3	20	13	7
				5									
SS-3	X	95	16				>4.5			11.9			
SS-4	X	65	15		820		>4.5	6.68	129.0	11.5			
				10		**CL-ML**, **SILTY CLAY**, trace sand and gravel, very stiff to hard, brown, gray below 18'							
SS-5	X	100	16		815		2.75			16.0			
				15									
SS-6	X	100	26		810		>4.5			11.0			
				20		End of Boring at 20 ft							
						Piezometer constructed at offset location.							

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	▽ 24 hrs After Drilling
To Water	NW	NW	5½
To Cave-in		14	12

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/19/14 End 5/19/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.: B-9
Elevation: 809.87
Datum: NAVD 88
EEI Proj. No.: 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	75° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1		65	8			**CL**, **LEAN CLAY**, trace sand and gravel, very stiff, brown	2.0			23.9	44	17	27
SS-2		100	15	5	805	**CL-ML**, **SILTY CLAY**, trace sand and gravel, very stiff to hard, wet at 7½', brown, with wet sand seams and partings from 7.5' to 18'	>4.5			10.7			
SS-3		100	11				2.5			12.5			
SS-4		65	16	10	800		>4.5			11.7			
SS-5		100	16	15	795		>4.5			9.9			
SS-6		100	20	20	790		>4.5			12.8			

End of Boring at 20 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	After Drilling
To Water	7½	12	BF
To Cave-in		16	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/13/14 End 5/13/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC
7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

Boring No.: B-10
Elevation: 796.1
Datum: NAVD 88
EEI Proj. No.: 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Partly Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	70° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1	X	35	6		795	**CL**, **SANDY CLAY**, medium stiff, brown	---			20.5			
SS-2	X	65	16	5			---			---			
SS-3	X	0	34		790	**SP**, **SAND AND GRAVEL**, little silt, medium dense to dense, wet, brown, with large cobbles below 7'							
SS-4	X	55	33	10	785								
SS-5	X	100	50/.3	15	780	**SM**, **SILTY SAND**, dense to very dense, wet, gray, with cobbles							
SS-6	X	0	50/.3	20	775								
SS-7	X	65	77	25		**CL-ML**, **SILTY CLAY**, little sand and gravel, hard, gray	>4.5			9.7			

End of Boring at 25 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	24 hrs After Drilling
To Water	7	7	NW
To Cave-in		7	3

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/13/14 End 5/13/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chips.

EARTH EXPLORATION INC

LOG OF TEST BORING

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. B-11
Elevation 807.5
Datum NAVD 88
EEI Proj. No. 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Cloudy	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	75° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		35	8	805	**CL**, **LEAN CLAY**, medium stiff to stiff, brown	1.75	1.43	105.7	27.0			
SS-2		65	6	5		1.0			26.0			
SS-3		0	31	800	**CL-ML**, **SILTY CLAY**, little sand and gravel, very stiff to hard, brown, gray below 14'	---			---			
SS-4		100	13	10		>4.5			11.2			
				795								
SS-5		100	18	15		3.25			11.4			
				790								
SS-6		100	26	20	**SP**, **SAND AND GRAVEL**, medium dense, wet, gray							

End of Boring at 20 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	▽ 24 hrs After Drilling
To Water	14	12	2
To Cave-in		17½	2

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/13/14 End 5/13/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

EARTH EXPLORATION INC

LOG OF TEST BORING

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture
7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. B-12
Elevation 799.88
Datum NAVD 88
EEI Proj. No. 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	80° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		65	9		**CL**, **LEAN CLAY**, stiff to very stiff, moist, brown, with wet sand seams near 7.5'	2.25			23.6			
SS-2		90	9	5 / 795		2.25	1.74	99.6	25.8			
SS-3		65	11			1.25			18.8			
SS-4		100	13	10 / 790	**ML**, **SILT**, medium dense, wet, gray	---			---			
SS-5		100	24	15 / 785								
SS-6		100	31	20 / 780	**SP**, **SAND AND GRAVEL**, medium dense to dense, wet, gray							
SS-7		100	23	25 / 775								
					End of Boring at 25 ft Piezometer constructed at offset location.							

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	After Drilling
To Water	7½	8	BF
To Cave-in		22	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/21/14 End 5/21/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. B-13
Elevation 797.05
Datum NAVD 88
EEI Proj. No. 1-14-202
Sheet 1 of 1

Proj. No. ---	Station ---	Weather Sunny	Driller J.S.
Struct. No. ---	Offset ---	Temp. 70° F	Inspector ---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		35	4	795	CL, LEAN CLAY, trace sand, stiff, brown	1.75			24.1			
SS-2		65	10	5	SP-SM, SILTY SAND AND GRAVEL, loose to dense, wet, gray	---			---			
SS-3		65	14	790								
SS-4		65	20	10								
				785								
SS-5		65	19	15								
				780								
SS-6		65	36	20								

End of Boring at 22 ft

Auger refusal at 22 ft.
Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	After Drilling
To Water	4	4	BF
To Cave-in		20	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/19/14 End 5/19/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture
Boring No.	B-14
Elevation	806.12
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	80° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft / Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					TOPSOIL							
SS-1		65	50/.3	805	**CL**, **LEAN CLAY**, stiff, brown, possible cobble at 1½'	1.75			21.3			
SS-2		65	8	5	**CL-ML**, **SILTY CLAY**, trace sand, medium stiff, brown	1.0			19.1			
SS-3		90	2	800		---			---			
SS-4		90	8	10 / 795	**ML**, **SILT**, very loose to medium dense, wet, brown							
SS-5		90	23	15 / 790								
SS-6		65	22	20 / 785	**CL-ML**, **SILTY CLAY**, little sand and gravel, hard, gray	>4.5			12.0			
SS-7		0	50/.1			---			---			

End of Boring at 23.6 ft

Auger refusal at 23.6 ft.
Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	After Drilling
To Water	7	4	BF
To Cave-in		12	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/20/14 End 5/20/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

Earth Exploration LLC

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. B-15
Elevation 801.64
Datum NAVD 88
EEI Proj. No. 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	75° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
						TOPSOIL							
SS-1		65	8		800	**CL-ML**, **SILTY CLAY**, trace sand, stiff, brown, with sand seams	1.75			19.5			
SS-2		65	14	5			---			---			
SS-3		65	27		795	**SP**, **FINE TO MEDIUM SAND**, medium dense, moist, brown							
SS-4		90	23	10	790	**CL-ML**, **SILTY CLAY**, little sand and gravel, hard, gray	>4.5			8.9			
SS-5		65	22	15	785		>4.5			13.0			
SS-6		35	36	20	780	**SP**, **SAND AND GRAVEL**, dense to medium dense, wet, gray	---			---			
SS-7		65	27	25									

End of Boring at 25 ft

Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	While Drilling	Upon Completion	24 hrs After Drilling
To Water	18½	17	NW
To Cave-in		17	8

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/12/14 End 5/12/14 Rig D120 ATV

Drilling Method 3¼" I.D. HSA

Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

EARTH EXPLORATION INC
7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

LOG OF TEST BORING

Project: Eastside Park
Location: Noblesville, Indiana
Client: CONTEXT Landscape Architecture

Boring No.: B-16
Elevation: 795.35
Datum: NAVD 88
EEI Proj. No.: 1-14-202
Sheet 1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	71° F	Inspector	---

No.	Type	Rec %	N Value	Depth ft	Elev	Description/Classification and Remarks	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					795	**TOPSOIL**							
SS-1		65	10			**SC-SM**, **CLAYEY SAND**, loose to medium dense, moist to wet below 3', gray							
SS-2		65	17										
				5	790	**ML**, **SILT**, medium dense to loose, wet, gray							
SS-3		100	10										
SS-4		65	12			**SP**, **SAND AND GRAVEL**, loose to medium dense, wet, gray							
				10	785								
SS-5		100	15			**CL-ML**, **SILTY CLAY**, little sand and gravel, hard, brown	>4.5 ---			14.2 ---			
				15	780								
AS-1		0	50/.2				---			---			

End of Boring at 18.7 ft

Auger refusal at 18.7 ft.
Piezometer constructed at offset location.

WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	After Drilling
To Water	6½	3	BF
To Cave-in		9½	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/13/14 End 5/13/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

LOG OF TEST BORING

EARTH EXPLORATION INC

Project	Eastside Park
Location	Noblesville, Indiana
Client	CONTEXT Landscape Architecture

7770 West New York Street - Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No.	B-17
Elevation	805.35
Datum	NAVD 88
EEI Proj. No.	1-14-202
Sheet	1 of 1

Proj. No.	---	Station	---	Weather	Sunny	Driller	J.S.
Struct. No.	---	Offset	---	Temp.	75° F	Inspector	---

SAMPLE No.	Type	Rec %	N Value	Depth ft	Elev	DESCRIPTION/CLASSIFICATION and REMARKS	q_p tsf	q_u tsf	γ_d pcf	W %	LL %	PL %	PI %
					805	**TOPSOIL**							
SS-1	X	65	8			**CL**, **LEAN CLAY**, very stiff, brown	3.0			19.9			
SS-2	X	100	12	5	800	**CL-ML**, **SILTY CLAY**, trace sand, very stiff to hard, brown, with trace organics near 15'	>4.5			12.9			
SS-3	X	65	14				2.25			16.6			
SS-4	X	90	11	10	795		3.25			11.9			
SS-5	X	65	26	15 ▼	790		2.75			13.4			
SS-6	X	90	19	20		**ML**, **SILT**, medium dense, wet, gray	---			---			

End of Boring at 20 ft

Piezometer constructed at offset location.

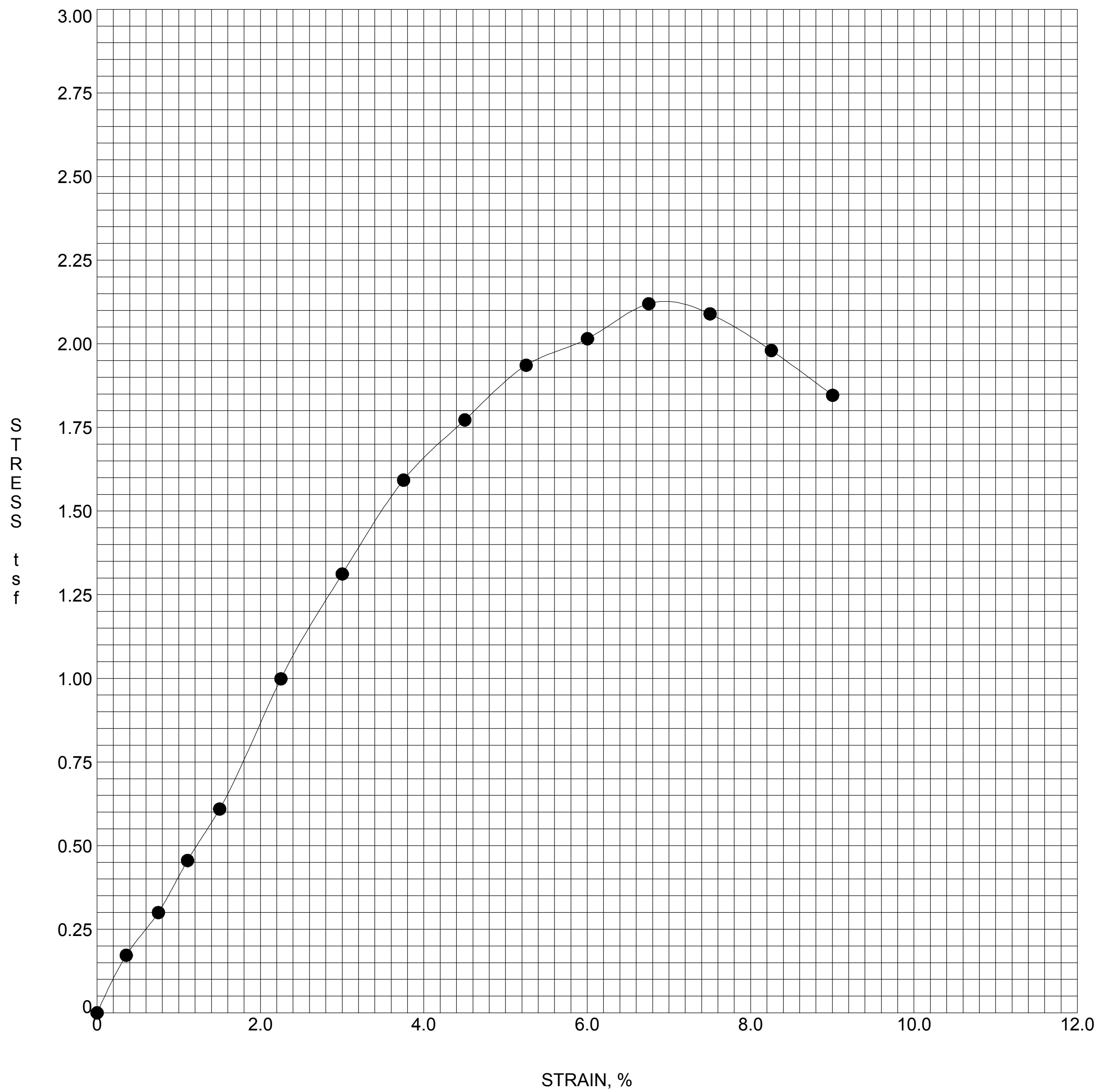
WATER LEVEL OBSERVATIONS

Depth ft	▽ While Drilling	▼ Upon Completion	After Drilling
To Water	NW	15	BF
To Cave-in		16	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 5/21/14 End 5/21/14 Rig D120 ATV
Drilling Method 3¼" I.D. HSA
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.



Sample Identification		Station / Offset / Line	Depth, ft	Classification
● B-3	SS-3	---	6.0 - 7.5	CL-ML, SILTY CLAY

Lab No.	Sample Ht., mm	Sample Diam., mm	Initial M.C., %	Initial Wet Den, pcf	Initial Dry Den, pcf	Sat., %	Unc. Comp. Strength, tsf	Failure Strain, %	Rate of Strain to Failure, %
16619SL	71.1	36.0	14.0	140.1	122.9	96.7	2.12	6.8	1.5

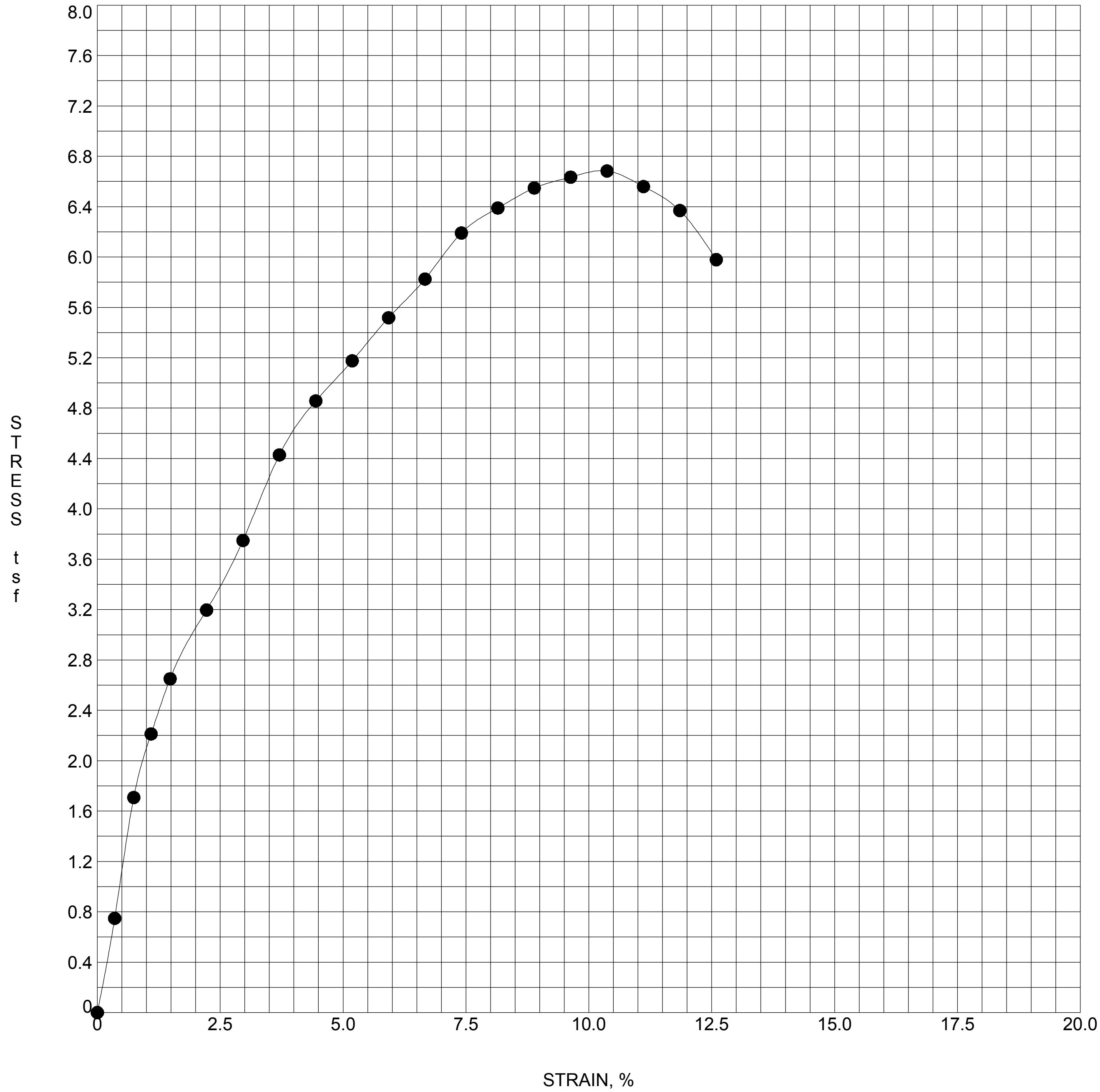
EARTH EXPLORATION INC

Project No. ---
Structure No. ---
EEI Proj. No. 1-14-202

Project Eastside Park
Location Noblesville, Indiana
Client CONTEXT Landscape Architecture

UNCONFINED COMPRESSION TEST

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample Identification		Station / Offset / Line	Depth, ft	Classification
● B-8	SS-4	---	8.5 - 10.0	CL-ML, SILTY CLAY

Lab No.	Sample Ht., mm	Sample Diam., mm	Initial M.C., %	Initial Wet Den, pcf	Initial Dry Den, pcf	Sat., %	Unc. Comp. Strength, tsf	Failure Strain, %	Rate of Strain to Failure, %
16620SL	72.0	34.5	11.5	143.8	129.0	95.7	6.68	10.4	1.5

EARTH EXPLORATION INC

Project No. ---

Structure No. ---

EEI Proj. No. 1-14-202

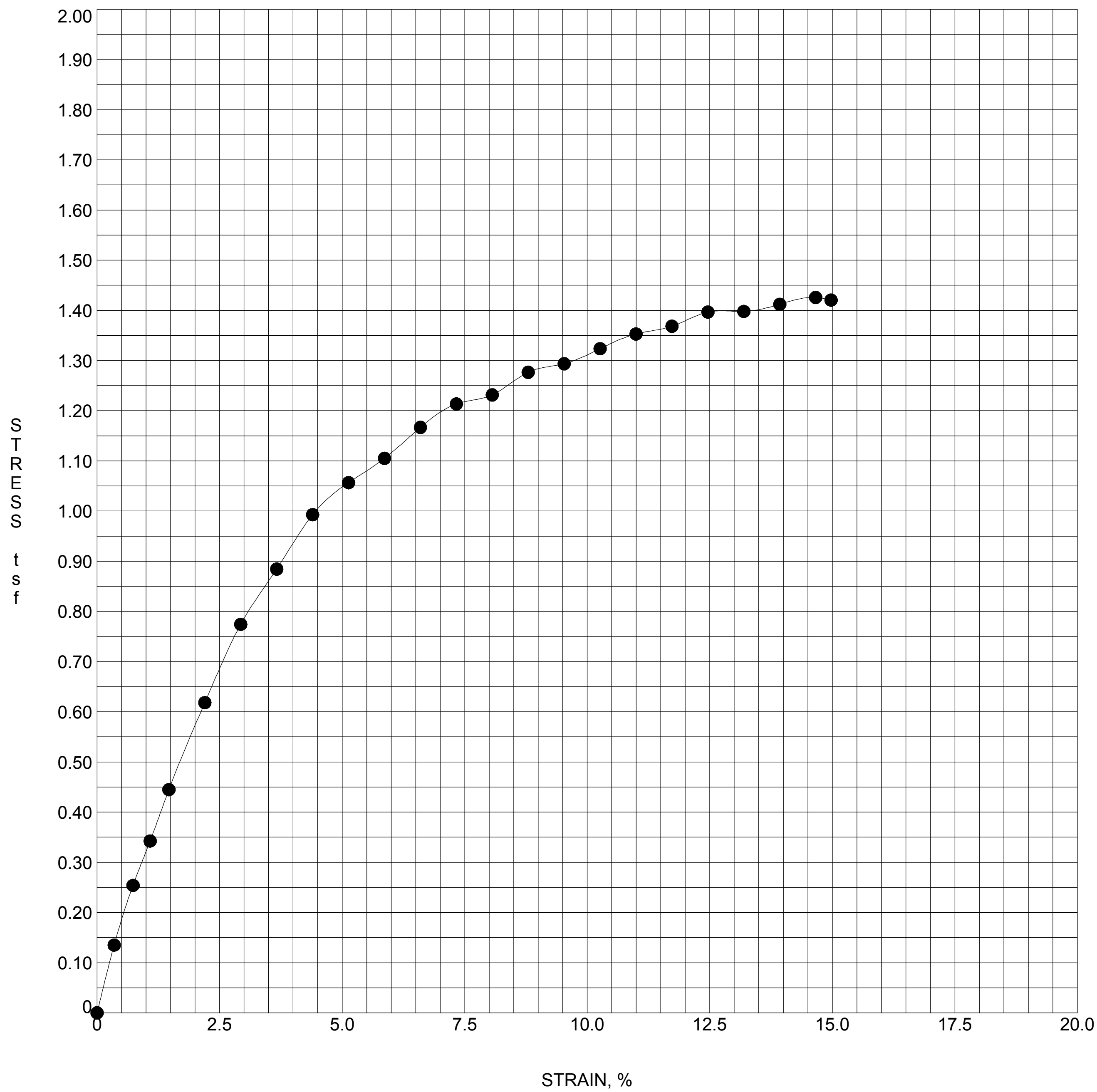
Project Eastside Park

Location Noblesville, Indiana

Client CONTEXT Landscape Architecture

UNCONFINED COMPRESSION TEST

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample Identification		Station / Offset / Line	Depth, ft	Classification
● B-11	SS-1	---	1.0 - 2.5	CL, LEAN CLAY

Lab No.	Sample Ht., mm	Sample Diam., mm	Initial M.C., %	Initial Wet Den, pcf	Initial Dry Den, pcf	Sat., %	Unc. Comp. Strength, tsf	Failure Strain, %	Rate of Strain to Failure, %
16621SL	72.8	35.2	22.0	129.0	105.7	98.8	1.43	14.7	1.5

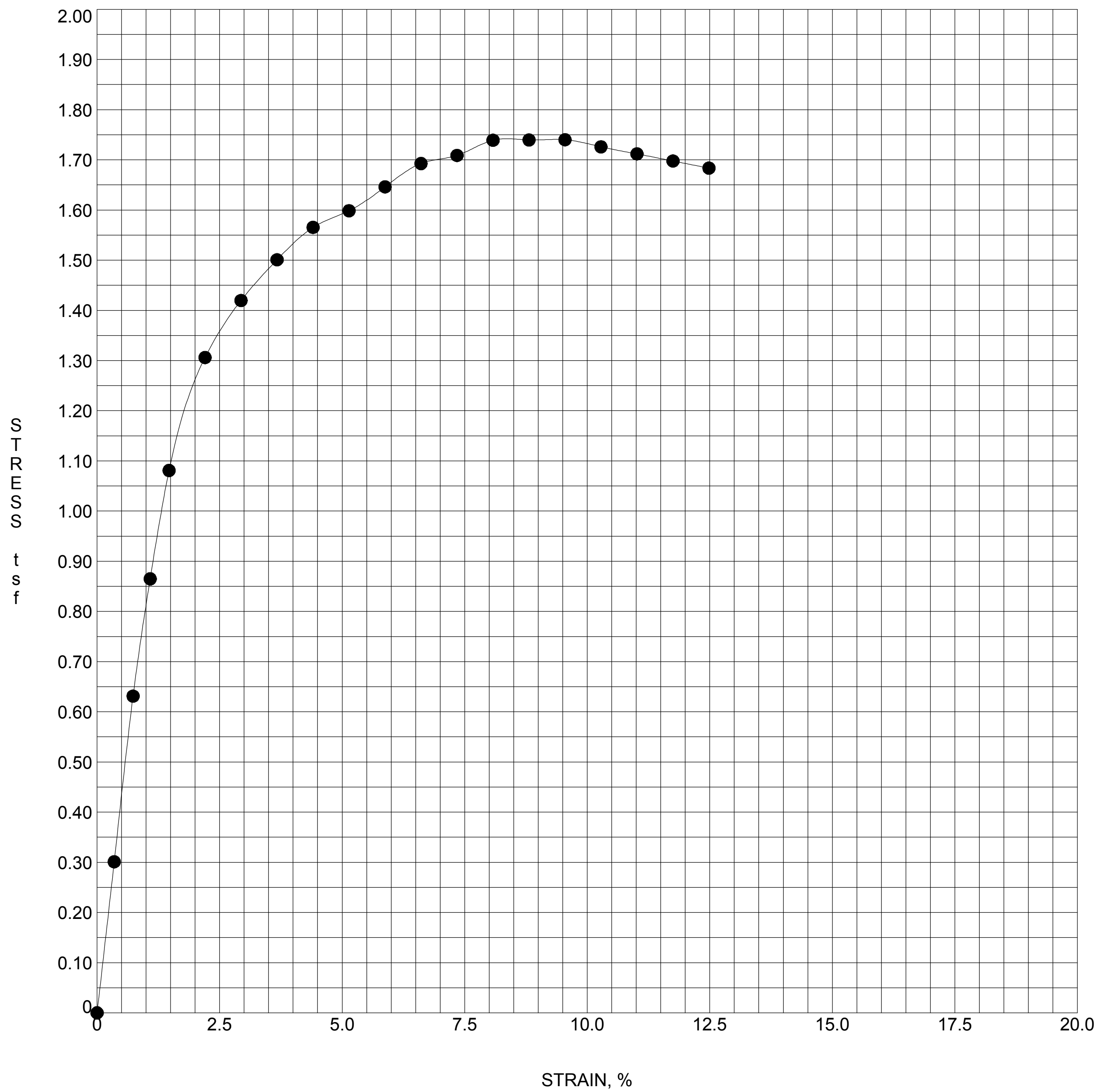
Earth Exploration Inc

Project No. ---
Structure No. ---
EEI Proj. No. 1-14-202

Project Eastside Park
Location Noblesville, Indiana
Client CONTEXT Landscape Architecture

UNCONFINED COMPRESSION TEST

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



	Sample Identification		Station / Offset / Line	Depth, ft	Classification
●	B-12	SS-2	---	3.5 - 5.0	CL, LEAN CLAY

Lab No.	Sample Ht., mm	Sample Diam., mm	Initial M.C., %	Initial Wet Den, pcf	Initial Dry Den, pcf	Sat., %	Unc. Comp. Strength, tsf	Failure Strain, %	Rate of Strain to Failure, %
16622SL	72.6	34.2	25.8	125.3	99.6	99.5	1.74	9.5	1.5

EARTH EXPLORATION INC

Project No.	---	**Project**	Eastside Park
Structure No.	---	**Location**	Noblesville, Indiana
EEI Proj. No.	1-14-202	**Client**	CONTEXT Landscape Architecture

UNCONFINED COMPRESSION TEST

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

APPENDIX D

GENERAL SPECIFICATION NO. 1

GENERAL SPECIFICATION NO. 1
Recommended Compacted Fill Specifications

Fill Materials

Fill may include cohesive soil meeting the Unified Soil Classification System (USCS) designation CL or CL-ML and granular soil meeting the USCS designation SP, SP-SM, SW, or SW-SM. The materials used for fill shall contain no vegetation, ash, wood, frozen material, organic soils, or any material which by decay or otherwise might cause settlement. Materials to be placed within 10 feet of building areas shall be free from rock, stone or broken concrete larger than 4-inches in the largest dimension. Outside building areas, pieces of concrete and large rocks or boulders, not exceeding 2 square feet for any area of surface, may be placed in fills without being broken up provided they are not placed within 2 feet of the final fill surface and they are well embedded and the interstices filled with smaller material as approved by the Engineer.

Placement Method

The approved fill material shall be deposited, spread and leveled in layers generally not exceeding 8-in. in thickness before compaction. For granular fill, moisture shall be added or the material shall be dried as required to permit proper compaction. For cohesive fill, or granular fill with a significant percentage of cohesive fines, the moisture content at compaction shall be within 2 percent of optimum moisture content. Cohesive fill material should also be adequately broken down by suitable equipment such as discs or plows as approved by the engineer.

It is the responsibility of the Contractor to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified compaction. Compaction by travel of grading equipment will not be considered adequate for uniform compaction. Hand guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density of the fill soil shall be determined in accordance with ASTM Test Designation D 1557. The recommended minimum field compaction as a percentage of the maximum dry density is indicated in Table 1.

Testing Procedures

Fifty (50) pound representative samples of proposed fill materials shall be submitted to an independent laboratory for particle size analysis/Atterberg limits testing and optimum moisture/maximum density determinations prior to the start of any filling operations.

Field density tests for determining the compaction of the fill shall be performed by a qualified testing laboratory in accordance with standard recognized procedures for making such tests. These tests shall be made on each lift at the outset and required by the Geotechnical Engineer for the balance of the job.

TABLE 1

Compaction Specifications

Area	Percent Compaction Fine-Grained Soil	Coarse-Grained* Soil
Within 10 feet of building lines:		
- Footing bearing soils	95	95
- Under floors, steps and walks	93 to 95**	95
Beyond 10 feet of building lines:		
- Under walks and paving	93	95
- Landscaped areas	90	93

* Coarse-grained soils are classified as those with more than 50% (by weight) larger than the No. 200 sieve.

** High end of range required for heavy floor loads and/or fill zones.