REPORT OF

GEOTECHNICAL ENGINEERING ANALYSIS

PROPOSED CHEF'S BURGER BISTRO
164 EAST GRAND AVENUE
CHICAGO, ILLINOIS

ECS PROJECT NO. 16:9010

FOR

OLD VETERAN CONSTRUCTION, INC.
CHICAGO, ILLINOIS

MAY 25, 2012

May 25, 2012

Mr. Michael J. Marec
Old Veteran Construction, Inc.
10942 South Halsted Street
Chicago, IL 60628
Email: Michael.M@OVCChicago.com

ECS Project No. 16:9010

Reference: Report of Subsurface Exploration and Geotechnical Engineering Analysis, Proposed Chef's Burger Bistro, 164 East Grand Avenue, Chicago, Illinois

Dear Mr. Marec:

ECS Midwest, LLC (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the proposed Chef's Burger Bistro to be located at the intersection of East Grand Avenue and North Saint Clair Street at the physical address of 164 East Grand Avenue in Chicago, Illinois.

A report, including the results of the subsurface exploration, boring data, laboratory testing, engineering recommendations, and a Boring Location Plan are enclosed herein. The recommendations presented are intended for use by your office and for use by other professionals involved in the design and construction stages of the project described herein.

We appreciate the opportunity to be of service to Old Veteran Construction, Inc. on this project. If you have questions with regard to the information and recommendations contained in this report, or if we may be of further service to you during the planning and/or construction phase of this project, please do not hesitate to contact the undersigned.

Respectfully,

ECS MIDWEST, LLC

(FOR)

Danilo A. Guevarra
Senior Project Engineer

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REPORT

PROJECT

Subsurface Exploration and
Geotechnical Engineering Analysis
Proposed Chef's Burger Bistro
164 East Grand Avenue
Chicago, Illinois

CLIENT

Old Veteran Construction, Inc.
10942 South Halsted Street
Chicago, IL 60628

SUBMITTED BY

ECS Midwest, LLC
1575 Barclay Boulevard
Buffalo Grove, Illinois 60089

Illinois Professional Design Firm
No. 184-004247

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EXECUTIVE SUMMARY

The subsurface conditions encountered during the subsurface exploration and ECS' conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The project site is located at the southwestern corner of the intersection of East Grand Avenue and North Saint Clair Street at the physical address of 164 East Grand Avenue in Chicago, Illinois. The proposed construction at the project site will consist of a structure having one to two above-grade levels and no below-grade levels. Of note, we understand the project team is looking to support portions of the new structure on the existing brick foundation system. In order to better understand the subsurface conditions at the project site, a series of test pits and hand auger borings supplemented with in-situ testing was performed at the project site. In general, the subsurface soils at the project site consist of urban fill underlain by natural sand.

Based on the subsurface conditions encountered at the project site, we are recommending four options for support of the proposed structure. The options are as follows:

- Spread footings bearing on the natural sand or granular engineered fill/lean concrete overlying natural sand with a net allowable bearing pressure of 6,000 psf.
- Spread footings bearing on a minimum of 5 feet granular engineered fill overlying urban fill with a net allowable bearing pressure of 2,000 psf.
- Shallow foundations bearing on urban fill improved with aggregate piers with an allowable bearing pressure in the range of 3,000 to 5,000 psf.
- Deep foundations (helical piers or ACIP piles) bearing in competent natural soils.

The existing foundations will need further evaluation to determine if they bear in the natural sand. If the existing foundations do not bear in the natural sand, further assessment will be required.

For support of the slab-on-grade, ECS is providing three options for preparation of the subgrade depending on the level of risk the owner is willing to accept. The options are as follows:

- Complete removal of the existing undocumented fill soils and replacement with granular engineered fill (low risk).
- Partial removal of the undocumented existing fill soils to a depth of two feet below subgrade and replacement with engineered fill (higher risk).
- Ground improved using aggregate piers.

As a fourth option, the floor slab could be designed as a structural slab connected to grade beams spanning deep foundation elements (helical piers or ACIP piles).

More detailed recommendations with regard to the building foundations, as well as the floor slab, underslab drainage and earthwork, are included herein and must be fully reviewed and understood so that the intent of the recommendations are properly utilized during the design and construction of the proposed building. We recommend that ECS be retained during construction of the proposed to monitor all earthwork / subgrade preparation and foundation construction to verify that the recommendations contained herein are adhered to.

Report Prepared By:

Danilo A. Guevarra
Senior Project Engineer

Report Reviewed By:

Brett Gitskin, P.E.
Senior Principal Engineer

PROJECT OVERVIEW

Introduction

This report presents the results of the subsurface exploration and ECS' geotechnical engineering analysis for the proposed Chef's Burger Bistro to be located at the southwest corner of East Grand Avenue and North Saint Clair Street with a physical address of 164 East Grand Avenue in Chicago, Illinois. A General Location Plan, included in the Appendix of this report, shows the approximate location of the project site.

This study was conducted in general accordance with ECS Proposal No. 16:10213-GP dated May 17, 2012, and authorized by your office. In preparing this report, we have utilized information from our current subsurface exploration as well as information from nearby sites and information from previous exploration performed by Testing Service Corporation (TSC) at the project site.

Site Location and Existing Site Conditions

The project site is located at the physical address of 164 East Grand Avenue in Chicago, Illinois. The project site is bound to the north by a public alley, to the south by East Grand Avenue, to the east by Saint Clair Street and to the west by a mid-rise structure. The project site is approximately 100 feet in the north-to-south direction by 50 feet in the east-to-west direction for an overall area in plan view of 5,000 square feet. The project site is currently developed by a one-story structure in the western portion of the site and a parking lot in the eastern portion of the site. The existing one-story structure is planned to remain and will be integrated into the proposed structure. The adjacent structure located northwest of the project site is reportedly to have a full basement level. Based on our review of the topographical survey integrated into TSC's boring location plan, existing site grades at the project site are in the range of EL. +13 to EL. +14, CCD.

Proposed Construction

Based on our review of the available documents and our recent correspondence with you, we understand that the proposed development will consist of a structure having one to two above-grade levels and no below-grade levels. The two-story portion of the structure will be located in the northern half (approximately 50 feet by 50 feet in plan dimensions) of the site. The one-story portion of the structure will be located in the southwestern portion (approximately 50 feet by 25 feet in plan dimensions) of the site. The southeastern portion of the site will consist of an at-grade level open dining area. Based on our recent conversations with you, we understand the project team is looking to support the new structure on the existing brick foundation system. A new foundation system will be required along the west wall in the northern third of the property. In addition, isolated column footings will be constructed in the interior of the structure.

The finished floor elevation (FFE) of the at-grade level is anticipated to approximately match existing site grades. Wall and column loads are anticipated to be as much as 6 klf and 160 kips, respectively.

Purpose of Exploration and Scope of Work

1. Reviewing the geotechnical reports prepared for nearby project sites by ECS and TSC;

2. Performing five (5) interior soil borings at the project site utilizing hand auger techniques;

3. Performing three (3) in-situ pressuremeter tests to further characterize relative strength and compressibility characteristics of the in-situ soil;

4. Performing laboratory tests on selected representative samples from the borings to evaluate pertinent engineering properties;

5. Analyzing the field and laboratory data to develop appropriate engineering recommendations; and,

6. Preparing this geotechnical report of our findings and recommendations.

The conclusions and recommendations contained in this report are based on the following:

- Five (5) interior hand auger soil borings (TP-1 through TP-5) conducted at the project site by an ECS field crew. The soil borings were performed using hand auger techniques at accessible locations inside the existing building to depths in the range of 7½ to 15 feet below the existing floor slab (i.e., EL. +6½ to EL. -1, CCD). Hand auger borings TP-1 and TP-2 were performed on the northern end of the existing east wall to depths in the range of approximately 9 feet below the existing floor slab (i.e., EL. +5, CCD). Hand auger borings TP-3, TP-4 and TP-5 were performed along the west and south walls of the existing building to depths in the range of 7½ to 15 feet below the top of the floor slab (i.e., EL. +6½ to EL. -1, CCD).

- Three (3) in-situ pressuremeter tests conducted at two test pit boring locations. One (1) in-situ pressuremeter test was performed at test pit location TP-3 at an approximate depth of 13 feet below the existing site grades (i.e., EL. +1, CCD). Two (2) in-situ pressuremeter tests were performed at test pit location TP-1 at approximate depths of 5½ feet to 8 feet below existing site grades (i.e., EL. +8½ to EL. +6, CCD).

The subsurface exploration included hand auger and split-spoon soil sampling, dynamic cone penetrometer (DCP) testing, pressuremeter tests and groundwater level observations in the boreholes. The results of the completed hand auger borings and in-situ pressuremeter testing, along with a Boring Location Plan are included in the Appendix of this report. The Boring Location Plan was developed from the drawings provided to ECS by Old Veteran Construction, Inc. (OVC). Prior to our field explorations, OVC excavated several test pits/trenches to depths ranging from 3½ to 7½ feet below the top of the existing floor slab along the west, east and south walls of the existing building to expose the existing foundation walls. OVC used a backhoe or hand dug the test pits/trenches. The hand auger borings were located in accessible locations within the excavated test pit/trench areas by ECS representatives and the approximate locations are shown on the Boring Location Plan. Ground surface elevations at the individual boring locations inside the building were interpreted based on the topographic survey integrated into TSC's Report of Soil Exploration. The existing finished floor elevation of the existing building is estimated to be in the range of EL. +14, CCD.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

ECS performed five (5) hand auger soil borings inside the existing building to evaluate the bearing soils at the project site. The hand auger borings were performed within the test pit/trench areas excavated by OVC to expose existing building foundations. The soils from the bottom of the excavated test pits/trenches were hand augered and sampled to depths of approximately 7½ to 15 feet below the top of the existing floor slab or to practical hand auger refusal. The soil samples from the hand auger borings were recovered using a bucket-type auger. At boring location TP-3, a split-barrel sampler, was used to collect soil sample and estimate the relative density of the granular soils at a depth of approximately 7½ to 9½ feet below the existing floor slab. In the split barrel sampling procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 24 inches by a 33-pound hammer falling about 36 inches. The number of blows required to drive the sampler was recorded and converted based on hammer energy to a Standard Penetration Test (SPT) values. The translated SPT-values are indicated for the soil sampling depth on the hand auger log.

Due to the nature of the fill soils encountered (i.e., fill with brick, concrete and debris) and obstructions, the ECS field crew experienced difficult hand augering and sampling from the bottom of the test pits/trenches. Hand auger boring locations TP-1, TP2 and TP-5 were terminated at a depth of approximately 9 feet below existing grade due to obstruction from brick, concrete, debris, etc. Hand auger boring locations TP-3 and TP-4 were terminated at a depth of approximately 15 feet and 7½ feet (where natural sand was encountered) below the top of the existing floor slab, respectively. The bottom of the existing wall footings could not be determined at the time of our field exploration because of the depths, granular nature of the soils and safety concerns.

DCP (dynamic cone penetrometer) testing with the use of a DCP apparatus similar to IDOT's DCP was also performed to estimate the relative density of the fill soils to an approximate depth of 2½ to 3 feet below the bottom of the excavated test pits/trenches. The DCP test was conducted by driving the cone into the soil, by dropping the approximately 10-pound hammer on the drive anvil from approximately 2-foot height and recording the number of blows per six-inch increments. The number of blows per six-inch increments was recorded and indicated on the hand auger logs. An ECS field engineer maintained a field log of the soils encountered in the hand auger borings. Representative portions of each soil sample were then sealed in jars and brought to ECS laboratory in Buffalo Grove, Illinois for further visual examination.

Pressuremeter Testing Program

In addition to the basic soil exploration program, an ECS Field Engineer performed three (3) in-situ pressuremeter tests. The in-situ pressuremeter tests were performed on existing fill and natural soils at depths ranging from about 5½ feet to 13 feet below existing site grades (i.e., EL. +8½ to EL. +1, CCD). The results from the pressuremeter tests are included in the Appendix of this report.

In the pressuremeter test, a radially expanding cylindrical probe is inserted into a specially prepared 2.5-inch diameter borehole. After insertion, the probe is expanded incrementally against the side of the hole with a combination of pressurized liquid and gas. Each pressure increment is maintained for one minute. The pressure increments are continued until failure of the soil is reached. The change in diameter of each borehole under each pressure increment is measured by the volume change in the center portion of the probe.

By plotting the probe volume versus pressure, a stress-volumetric strain curve is obtained. From this curve, three parameters are obtained for the computation of the soil bearing value and compression. The first parameter is the creep pressure, P_f, which indicates the upper limit of the "pseudo-elastic" zone and indicates the pressure at which movements of the soil particles continue under constant load. The second parameter is the limit pressure, P_l, which is defined as the pressure at which the soil reaches failure. A third parameter is the modulus of deformation, E_d, which is derived from the slope of the stress-volumetric strain curve in the "pseudo-elastic" zone. The modulus of deformation, E_d, is used to estimate settlements of the foundation system elements and other loaded areas.

The main purpose of performing the pressuremeter testing program is to obtain a more accurate measure of deformation modulus, which is used to calculate the settlement characteristics of soils more accurately than in modulus correlations derived from conventional SPT testing.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to estimate engineering properties. The laboratory testing program included visual classifications. Each soil sample was classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified System is included with this report. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal

EXPLORATION RESULTS

Soil Conditions

A total of five (5) interior hand auger soil borings, designated as TP-1 through TP-5, were performed at the project site. Hand auger borings TP-1 and TP-2 were performed on the northern end of the existing east wall to depths in the range of approximately 9 feet below the existing floor slab (i.e., EL. +5, CCD). Hand auger boring TP-3 was performed along the south wall of the existing building to a depth in the range of 15 feet below the top of the floor slab (i.e., EL. -1, CCD). Hand auger borings TP-4 and TP-5 were performed along the west walls of the existing building to depths in the range of 7½ to 9 feet below the top of the floor slab (i.e., EL. +6½ to EL. +5, CCD). The subsurface conditions encountered at the borings performed at the site are summarized below. The specific soil types observed at the boring locations are noted on the boring logs enclosed in the Appendix.

The surficial material at the ground surface was observed to consist of approximately 4 inches of portland cement concrete floor slab. Below the existing floor slab, the soil conditions were observed to consist predominantly of urban FILL (i.e., sand, gravel, brick and concrete fragments) with relatively higher percentage of fine to medium sand FILL materials. The FILL contained trace amounts of wood, ceramics and other foreign materials. Old utility pipe lines were noted immediately beneath the floor slab.

The FILL was observed to extend more than 9 feet below the existing floor slab at hand auger boring locations TP-1, TP-2 and TP-5. The FILL was observed to extend at a depth of approximately 7½ feet below the existing floor slab at hand auger boring location TP-4. At boring location TP-3, urban fill was observed to extend approximately 3 feet below the existing floor slab underlain by predominantly Fine to Medium Sand FILL with varying amounts of gravel to a depth of approximately 11 feet below the existing floor slab. Below 11 feet (about +2 to 3 CCD), apparent natural, brown fine to medium SAND (SP) was encountered to the termination depth of the boring location TP-3 (i.e., 15 feet below the existing floor slab).

Based on our field observations and the results of DCP testing and split spoon sampling, the FILL materials appeared to be very loose to loose in relative density. Because the FILL materials contained brick and concrete materials, some voids could also be present within the existing fill deposits.

General

It should be noted that bid quantity estimation by "averaging" depths and strata changes from boring logs is not permitted. Too many variations exist for such "averaging" to be valid, particularly in the thickness of fill depths, soil types and condition, depth, and groundwater conditions. A different scope of professional services would be required to obtain subsurface information needed for earthwork bid preparation. This scope could include additional borings and test pits. Even with this additional information, contingencies should always be carried in construction budgets to cover variations in subsurface conditions. Soil borings cannot present the same full-scale view that is obtained during complete site grading, excavation or other aspects of earthwork construction.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the hand auger operations at the boring locations. In hand auger operations, the groundwater position can often be obtained by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the hand auger exploration can often be used in evaluating the groundwater conditions. Groundwater was not encountered at the hand auger boring locations during and upon completion of hand augering operations.

The highest groundwater observations are normally encountered in late winter and early spring and our current groundwater observations are not expected to be at the seasonal maximum water table. It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run-off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove water that may accumulate in the proposed excavations as well as floor slab areas.

Interior Foundation Observations

The existing structure was reportedly constructed in two phases. ECS performed visual observations of the exposed structure foundations (exposed by OVC prior to our mobilization) during our field subsurface exploration. Based on our field observations, the southern two-thirds (+/-) of the existing structure appeared to be founded on a 3-wythe brick and/or limestone block assembly foundation system. Along the southern two-thirds of the west wall (against the east wall of the adjacent building), the lot line foundation was observed to be approximately 13 to 23 inches wide. The northern third (approximately 30 feet) of the structure along the west wall did not appear to have a foundation system. Along the southern two-thirds of the east wall, the limestone block foundation was observed to protrude approximately 6½ inches from the east brick wall. Assuming the footing dimensions on both sides of the east wall are symmetrical, the limestone block wall footing was approximately 22 inches in width. Based on the excavated test pits, the footing along the northern third of the east wall was observed to consist of an approximately 3-wythe brick footing assembly (about 13 inches in width). The south wall of the structure was observed to consist of a 2-brick wythe footing assembly (approximately 9 inches in width). The north wall footing was not exposed by OVC at the time of our field explorations.

The bottom elevation of some of the exposed footings could not be confirmed at the time of our field exploration due to safety concerns, limited space and brick/concrete obstructions. OVC attempted to excavate as deep as feasible along the west wall (i.e., 7½ feet below the top of the existing slab) and east wall (i.e., 6 feet below the top of the existing slab) utilizing the on-site backhoe. The bottom of the footing on the southern two-thirds of the west wall appeared to be located deeper than 7½ feet below the top of the existing floor slab and possibly located near the footing elevation of the adjacent building basement level. The bottom of the footing on the southern two-thirds of the east wall appeared to be located deeper than 6 feet below the top of the existing floor slab. Based on the soil conditions encountered during our hand auger exploration and TSC's soil exploration, it is possible that the footing along the southern two-thirds of west wall is bearing on natural sand soils and the footing along the southern two-thirds of the east wall is bearing on either existing fill or natural soils. We believe it more likely the foundations bear on natural soils as well, whether at the deeper elevation or shallower. The bottom of the south brick wall was observed to be located at a depth of approximately 3½ feet below the top of the existing slab and bearing on existing fill materials. No typical footing (i.e., concrete or limestone block foundation) was observed on the excavated south brick wall.

ANALYSIS AND RECOMMENDATIONS

Overview

The conclusions and recommendations presented in this report should be incorporated in the design and construction of the project to reduce possible soil and/or foundation related problems. The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered at the project site. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS Midwest, LLC should be consulted so that the recommendations of this report can be reviewed and modified, if necessary.

The following sections present specific recommendations with regard to the design of the proposed building. These include recommendations with regard to building foundations, subgrade preparation and earthwork, fill placement, floor slab design and construction dewatering. Discussion of the factors affecting the building foundations for the proposed construction, as well as additional recommendations regarding design and construction at the project site are included below. We recommend that ECS review the final design and specifications to check that the earthwork and foundation recommendations presented in this report have been properly interpreted and implemented in the design and specifications.

Foundation Recommendations

We understand that the proposed development will consist of a structure having one to two above-grade levels and no below-grade levels. We also understand the project team is considering utilizing the existing brick/limestone foundation system to support the new structure on. A new foundation system will be required along the west wall in the northern third of the property. The finished floor elevation (FFE) of the at-grade level is anticipated to approximately match existing site grades. Wall and column loads are anticipated to be as much as 6 klf and 160 kips, respectively. **Once the actual loads for existing and new footings become available, ECS should be contacted so we can review our recommendations discussed herein including bearing pressures and revise if appropriate based on actual design loads.**

Existing Foundation Evaluation

As mentioned earlier, the bottom elevation of some of the exposed footings could not be confirmed at the time of our field exploration due to safety concerns, limited space and brick/concrete obstructions. OVC attempted to excavate as deep as feasible along the west wall (i.e., 7½ feet below the top of the existing slab) and east wall (i.e., 6 feet below the top of the existing slab) utilizing the on-site backhoe. The bottom of the footing on the southern two-thirds of the west wall appeared to be located deeper than 7½ feet below the top of the existing floor slab (likely located near the footing elevation of the adjacent building basement level). The bottom of the footing on the southern two-thirds of the east wall appeared to be located deeper than 6 feet below the top of the existing floor slab. Based on the soil conditions encountered during our hand auger exploration and TSC's soil exploration, we have assumed that the footing along the southern two-thirds of the west wall is possibly bearing on natural sand soils and the footing along the southern two-thirds of the east wall is bearing on either existing fill or natural soils (but more likely on natural soils as well). The bottom of the south brick wall was observed to be located at a depth of approximately 3½ feet below the top of the existing slab and bearing on existing fill materials.

To evaluate the suitability of re-using the existing footings to support the proposed structure, a maximum net allowable soil bearing pressure of 6,000 psf can be used for the existing footings (i.e., existing west wall footing) that are confirmed to be bearing on natural sand soils encountered below the existing urban fill. It will be necessary to confirm that these foundations are in fact bearing on the natural sand soils encountered in our exploration (and the prior TSC exploration) at an elevation of about +2 to 3 CCD, or 10 to 11 feet below existing grade. For foundations that are (or appear to be) bearing at higher elevations, natural sand soils must be verified beneath the footings, or the allowable bearing pressure should be reduced. Alternatively, the foundations could be lowered to bear on competent natural sand soils. Therefore, some additional test pit explorations will need to be done prior to construction to confirm the foundation bearing elevation and materials, for those locations that could not be verified in the recent investigation. The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. We recommend that the bottom of the footings be verified in the field either prior to, or if not feasible, during construction. ECS should be present to observe the actual conditions, and the allowable soil bearing pressure for footing design should be revised or the foundation system reinforced, as appropriate, based on actual footing and subgrade conditions. **Due to the potential increase in lateral loads, the existing lot line footing along the west wall should not be utilized to support the proposed structure if the existing footings are determined to be located above the existing footing of the adjacent building (i.e., adjacent basement footing). In addition, existing wall footings that are determined to bear on the existing unsuitable urban fill (i.e., south wall of the existing building) should not be used to support the proposed structure, without ECS performing location specific in-situ testing, to determine the appropriate safe, soil bearing pressure. Safe soil bearing pressure is defined as limiting future settlement to no more than 1 inch. Unless ECS performs location specific testing on any foundation proposed to be re-used that is bearing in or on the existing fill the foundation should not be re-used.**

We normally recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches to reduce the potential for foundation bearing failure and excessive settlement due to local shear or "punching" action. We do note the existing footings have performed for many decades, without evidence of "punching" and therefore, provided the new proposed loads are not more than 5% higher than the estimated existing loads, in our opinion, the risk of a "punching" type failure is minimal. Therefore, for existing footings that are determined to be less than 18 inches in width and proposed to support the proposed structure consideration should be given to widening and reinforcing the foundation system for foundations where the new load will be greater than 150% of the current estimated load. ECS can evaluate each of these conditions, if any, on an individual basis and provide our recommendations on the need for widening.

New Footings

The proposed one- to two-story structure can be supported on a conventional shallow foundation system (i.e., isolated spread and strip wall footings) bearing in competent natural brown fine sand soils or compacted, granular engineered fill/lean concrete overlying competent natural sand soils. Because the existing urban fill materials are undocumented, exhibit very loose to loose relative densities and contained brick, concrete and other deleterious materials, we do not recommend the conventional shallow footings bear on or above the existing fill. The existing urban fill encountered at the project site will likely settle over time beneath new foundations and slabs. The borings performed within the limits of the proposed structure encountered undocumented fill soils to a depth of about 8 to 11 feet below existing grades. Therefore, undercutting/overexcavation and replacement with granular engineered fill/lean concrete from the bottom of the proposed footing to as deep as 11 feet below existing grades should be anticipated in new foundation areas.

A shallow foundation system bearing in the competent natural fine sand soils or compacted engineered granular fill/lean concrete overlying competent natural sand soils can be designed for maximum net allowable soil bearing pressures of 6,000 psf. As an alternative, removal of existing unsuitable fill materials can be limited to a depth of 5 feet below the footing bottom elevation and the unsuitable fill replaced with granular engineered fill. New footings bearing on at least 5 feet of new granular engineered fill, placed and compacted as recommended herein may be designed for a maximum net allowable soil bearing pressure of 2,000 psf. Lean concrete is not an acceptable backfill material if this alternate, where the existing fill will remain below the footings, is implemented.

We recommend the unsuitable existing fill soils be replaced with compacted engineered granular fill or lean concrete to the foundation bottom elevation. The existing natural sand subgrade should be densified to the extent practical with vibratory equipment prior to placement of new engineered fill to raise subgrades. If granular engineered fill is utilized, the engineered fill should be compacted to a minimum of 95% of the maximum dry density in accordance with Modified Proctor Method, ASTM Specification D 1557. We recommend engineered granular fill similar to Illinois Department of Transportation (IDOT) crushed aggregate CA-6 (recycled concrete, crushed limestone or crushed gravel) should be used as engineered fill to replace unsuitable soils beneath footings. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. If lean concrete is utilized to replace weaker/low bearing soils or unsuitable soils, no lateral over-excavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side), and the lean concrete should be allowed to harden prior to placement of the footing concrete.

Settlement of individual footings, designed in accordance with our recommendations presented in this report, is expected to be small and within tolerable limits for the proposed building. For footings placed on suitable natural soils or properly compacted engineered fill, maximum total settlement is expected to be in the range of 1 inch or less. Maximum differential settlement between adjacent columns is expected to be half the total settlement. These settlement values are based on our engineering experience with the soil and the anticipated structural loading, and are to guide the structural engineer with his design. In areas where individual footings are founded at different elevations, it is important to provide a minimum slope of 1H:1V between the bottom edge of each foundation at their closest point.

Other Foundation Options

Considering the extensive depths of removal and replacement of unsuitable existing fill and cost of disposing soils off site, the option of removal and replacement may not be economical (construction cost). We have provided foundation options and ground improvement techniques that can be considered to support the proposed building as discussed below. Considerations should be given to consider the options below that may be more feasible and economical compared to removal and replacement of existing fill.

- Shallow Foundation System with Aggregate Piers

  Ground improvement using drilled aggregate piers (densified aggregate piers) can also be considered beneath foundations. Drilled aggregate piers are a ground improvement technique in which a column of soil is replaced with crushed stone that is densified with vibratory or ramming techniques. The footings are then designed for a bearing pressure appropriate for the densified aggregate pier and the remaining soil surrounding the pier. Aggregate piers are typically designed to extend through unsuitable fill materials and soft soils and bear in more competent natural soils at depth. The aggregate piers are typically 24-inch to 30-inch (minimum) in diameter. The soil reinforcement occurs as a result of the excavation of unsuitable fill and soft soils and replacement by vibrated or compacted dense granular aggregate. The advantages of this option are: (1) foundation subgrades can stay at a relatively uniform subgrade level without the need for undercutting, as the presence of the piers provides adequate support to the shallow foundation, and (2) the volume of undercut material will be reduced, which will reduce the costs associated with disposing of materials off-site.

  Aggregate piers can be utilized under the building footprint to support walls and columns. Our experience indicates that for the anticipated structural loads and subsurface conditions, an allowable bearing pressure (after aggregate pier installation) in the range of 3,000 to 5,000 psf should be feasible. In addition, the aggregate piers can be utilized under building floor slabs to reduce undesirable settlement and future maintenance.

  The drilled aggregate pier system should be designed by a design-build contractor and the proposed soil improvement plan should be reviewed by the Geotechnical Engineer of Record (GER) before construction begins. While design of this system would be performed by others, the design could be such that total and differential settlements would be limited to 1 inch and ½ inch, respectively. The design-build contractor should be made aware of the presence of deleterious materials including building rubble and old foundations at the site and should price his/her design and bid accordingly. The design-build contractor will provide final design and quality assurance, but based on soils at the project site and our experience, the maximum allowable bearing capacity is likely to be in the range of 3,000 psf. Aggregate piers must extend below the unsuitable fill materials encountered at a depth of approximately 8 to 11 feet below existing site grades.

- Helical Piers/Augered Cast-in-Place Piles

  Steel helical piers or augered cast-in-place (ACIP) piles and grade beams may also be considered to support the proposed building. Helical piers and ACIP piles can be used to transfer the structure loads to the suitable natural soils. Helical piers or ACIP piles should extend through the existing urban fill into competent, natural sand/clay soils. Estimates of helical pier capacity are usually prepared utilizing proprietary bearing capacity methods unique to the pier manufacturers and the various pier configurations. ECS can provide pile capacities should that option be considered. Additional review of this alternative by an authorized helical pier manufacturer's representative should be considered. Our previous experience suggests the helical pier foundation manufacturer will interpret the available subsurface information and provide appropriate foundations based upon proprietary design criteria. Typical capacities of steel helical piers are about 30 to 40 kips, while ACIP piles can support similar loads, or in some cases higher loads. Based upon the soil conditions, we would estimate ACIP piles would be able to support working loads in the range of 25 to 60 kips. The spacing and configurations of steel helical piers or ACIP piles will depend on the actual foundation loads and reinforcement but typically 5 to 8 feet on center with groups under footings.

<u>General</u>

Care should be exercised when excavating adjacent to the existing building footings. Excavations should not extend below the level of existing foundations unless adequate support or underpinning is previously installed to prevent undermining the existing footings. The base of new footings adjacent to the existing building should bear at the same elevation as existing footings. The sides of footings adjacent to the existing building should be separated at least 12 inches to reduce overlapping pressure distribution.

We recommend that the excavation/backfill of new foundations be monitored full-time by an ECS Geotechnical Engineer or his representative to verify that the soil bearing pressure is consistent with the boring log information obtained during the geotechnical exploration. We recommend that hand auger probes with in-situ DCP (dynamic cone penetrometer) testing be performed to a depth below the foundation subgrade equivalent to ½ the footing width (i.e., ½ B), or a minimum of 3 feet below each isolated column footing and to at least 2 feet below continuous footings. Hand auger probes with in-situ DCP tests should be performed at each column footing and at approximately 20-foot intervals along new continuous footings to verify the suitability of the soils to support the recommended maximum net allowable bearing pressure.

In the event, unsuitable/very loose/soft soils are encountered at the footing subgrades, we recommend the footing subgrades should be evaluated by an ECS geotechnical engineer or his representative to determine if removal and replacement will be required. The depth of removal and replacement of unsuitable/very loose/soft soils (if required), should be further evaluated and confirmed at the time of excavation/construction. Consideration should be given to using engineered fill or lean concrete to replace unsuitable/very loose/soft soils (if required). Engineered fill should be compacted to a minimum of 95% of the maximum dry density in accordance with Modified Proctor Method, ASTM Specification D 1557. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. If lean concrete is used to replace weaker/low bearing soils or unsuitable soils, no lateral overexcavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side).

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate.

The foundation contractor should be prepared to remove and/or break up obstructions from existing uncontrolled fill, buried slab and remnant foundations without delay. If problems are encountered during the subgrade preparation, or if site conditions deviate from those encountered during our subsurface exploration, ECS should be notified immediately. We recommend that the excavation/backfill of footings be monitored full-time by an ECS Geotechnical Engineer or his representative to verify that the soil bearing pressure are consistent with the boring log information obtained during the geotechnical exploration and engineered fill is placed in accordance with our recommendations discussed herein.

Subgrade Preparation

Initial preparation of the site should consist of complete removal of existing concrete slabs, pavements, abandoned utilities and other deleterious or refuse material. The earthwork operations and subgrade preparation should be monitored by an ECS geotechnical field engineer or his field representative to make sure unsuitable soils and other deleterious material is stripped.

Subgrade Preparation – Building Floor Slab Areas

Undocumented urban FILL materials were encountered at the project site to a depth of approximately 8 feet to 11 feet below existing grades. As mentioned earlier, if the existing unsuitable urban fill are left in place beneath foundations and slabs or ground improvement is not implemented, the existing urban fill will settle over time under loading, resulting in slab distress.

To reduce the potential for future slab settlement resulting in slab distress, cracking and long term maintenance issues, we recommend the following four options for building slab construction.

1. Remove the existing undocumented fill in its entirety and replace with engineered fill, placed and compacted as recommended in this report. The existing granular fill materials can be properly screened (granular fill material only to be re-used, all particles greater than 3 inches in any dimension, along with organic and deleterious material should be removed prior to re-use) for reutilization as subgrade. Reuse of on site materials where feasible may be preferable to off site disposal due to economics. The

screened existing fill material should be replaced and compacted in accordance with our recommendations discussed in the **Fill Placement** section. Conventional slabs on grade beams may be used if the existing fill are completely removed and replaced with new engineered fill.

2. If the Owner is willing to accept some risk of future slab distress and the long-term associated maintenance costs, a lower cost option for slab support would be to remove 2 feet of material, densify the exposed subgrade to the extent feasible under the observation of an ECS representative and replace the material (screened and sifted as described above) in 3, 8 inch lifts, compacted to 95% of the maximum dry density obtained in accordance with ASTM D 1557, Modified Proctor Method

3. Ground improvement using aggregate piers similar to those recommended in the **Foundation Recommendations** section of this report. After ground improvement, conventional slabs can be constructed on improved subgrades.

4. Use a deep foundation system (i.e., helical pier foundations/auger cast in place piles) and design the slab as a structural slab connected to grade beams spanning foundation elements.

If the owner is willing to accept premature slab distress and long-term maintenance issues due to settlement of existing unsuitable fill materials, the owner can consider leaving the existing undocumented fill materials in place beneath the slab areas (See Option 2). Upon removing/stripping existing pavements and concrete slabs and other deleterious organic or refuse material, the exposed subgrades should be observed by the Geotechnical Engineer of Record or his authorized representative and be proofrolled. Proofrolling using a loaded dump truck, having an axle weight of at least 10 tons, can be used to aid in identifying localized soft or unsuitable material which should be removed. Prior to proofrolling, the exposed existing fill subgrades be densified to the extent practical with heavy-duty vibratory compaction equipment. The densification and proofrolling of the exposed subgrades should be performed under the observation of the Geotechnical Engineer of Record or his authorized representative. If soft or yielding soils are observed during the densification/proofroll, the soft or yielding soils should be undercut a maximum of 3 feet and replaced with compacted and engineered fill to the design subgrade in accordance with the **Fill Placement** section of this report.

Although the owner may be willing to accept the risk associated with leaving the undocumented fill in-place and supporting the new construction over these materials, the rate and magnitude of settlement cannot be reasonably estimated. Consequently, unacceptable total and/or differential settlement should be expected to occur. Such settlement may result in temporary or permanent loss of use of portions of the structures. Consequently, ECS does not recommend supporting the proposed construction on shallow foundations or conventional slabs on grade directly overlying the existing fill.

Subgrade Preparation - General

All underground utilities should be positively located, properly protected and supported. Underground utilities within the proposed project areas should be relocated or removed and backfilled with engineered fill. Abandoned utilities should be removed or grouted in place. The contractor should be responsible for underpinning or other adequate support during excavations adjacent to existing utilities, sidewalks and foundations.

The contractor shall control surface water runoff and to remove any water from precipitation that may accumulate in the subgrade areas, especially during the wet season. When wet and subjected to construction traffic, softening and disturbance of the exposed subgrade soils may occur. Construction traffic should be limited when the subgrade is wet. During final preparation of building pad and pavement subgrades, a smooth drum roller should be used to provide a flat surface and provide for better drainage to reduce the negative impact of rain events. The need for and most appropriate type of subgrade stabilization required will be dependent upon soil, groundwater and weather conditions, as well as, the construction schedule and methods of construction that will be used. If the project timeline will not allow for adequate drying of unstable, soft and high moisture soils to improve subgrade stability, ECS recommends the unstable, soft, and high moisture soils be removed and replaced with new engineered fill.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate.

If problems are encountered during the earthwork operations, or if site conditions deviate from those encountered during our subsurface exploration, ECS should be notified immediately. We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and observe the proofrolling of the subgrades.

Fill Placement

All fills should consist of an approved material, free of organic matter, debris and particles greater than 3-inches and have a Liquid Limit and Plasticity Index less than 40 and 15, respectively. Unacceptable fill materials include topsoil and organic materials (OH, OL), high plasticity silts and clays (CH, MH), and low-plasticity silts (ML). Under no circumstances should high plasticity soils be used as fill material in proposed structural areas or close to site slopes. We recommend the existing urban fill materials with brick and concrete should not be used as engineered fill beneath structural areas. The existing granular fill materials can be reused if properly screened as described in the subgrade preparation section above including removing brick, concrete, particles greater than 3 inches in diameter and other deleterious materials. We recommend consideration be given to use well-graded granular material as backfill materials. We do not recommend the use of 3-inch stone or pea gravel as engineered fill to backfill undercuts, particularly under floor slabs and foundations. Due to the large diameter and absence of fines, the 3-inch rock exhibits large voids. Pea gravel is open-graded and consists of rounded particles that do not interlock. Fill materials containing large voids and rounded particles are more susceptible to future movement that may become unstable resulting in excessive and variable settlement

Fill materials should be placed in lifts not exceeding 8-inches in loose thickness and moisture conditioned to within ±2 percentage points of the optimum moisture content. Soil bridging lifts should not be used, since excessive settlement of overlying structures will likely occur. Controlled fill soils should be compacted to a minimum of 95% of the maximum dry density obtained in accordance with ASTM D 1557, Modified Proctor Method.

The expanded footprint of the proposed pad, pavement and fill areas should be well defined, including the limits of the fill zones at the time of fill placement. Grade control should be maintained throughout the fill placement operations. All fill operations should be observed on a full-time basis by a qualified soil technician to determine that the specified compaction requirements are being met. A minimum of one compaction test per 2,500 square foot area should be tested in each lift placed. Within trench or other localized excavations, one test for each 50 linear feet of each lift of fill shall be performed. The elevation and location of the tests should be clearly identified at the time of fill placement.

Compaction equipment suitable to the soil type used as fill should be used to compact the fill material. Theoretically, any equipment type can be used as long as the required density is achieved; however, the standard of practice typically dictates that a vibratory roller be utilized for compaction of granular soils and a sheepsfoot roller be utilized for compaction of cohesive soils. In addition, a steel drum roller is typically most efficient for compacting and sealing the surface soils. All areas receiving fill should be graded to facilitate positive drainage away from the building pad and pavement areas.

It should be noted that prior to the commencement of fill operations and/or utilization of off-site borrow materials, the Geotechnical Engineer of Record should be provided with representative samples to determine the material's suitability for use in a controlled compacted fill and to develop moisture-density relationships. In order to expedite the earthwork operations, if off-site borrow materials are required, it is recommended they consist of suitable fill materials in accordance with the recommendations previously outlined in this section.

Fill materials should not be placed on frozen soils or frost-heaved soils and/or soils that have been recently subjected to precipitation. All frozen soils should be removed prior to continuation of fill operations. Borrow fill materials, if required, should not contain frozen materials at the time of placement. All frost-heaved soils should be removed prior to placement of controlled, compacted fill, granular subbase materials, foundation or slab concrete, and asphalt pavement materials.

Floor Slab Design

For the design and construction of the slabs-on-grade for the proposed buildings, we recommend that the recommendations provided in the sections entitled **Subgrade Preparation and Earthwork Operations** and **Fill Placement** be followed. Complete removal and replacement of undocumented fill materials, ground improvement or structural slabs (with deep foundation system) should be considered to reduce the potential for premature slab distress and long term maintenance issues due to settlement of existing fill. If the owner is willing to accept risk of premature slab distress and long-term maintenance issues, the owner can consider leaving the existing fill in place, which we don't recommend.

If the existing undocumented fill materials or ground improvement are completely removed and replaced, the floor slab thickness can be determined utilizing an assumed modulus of subgrade reaction of 150 pounds per cubic inch (pci). If the existing undocumented fill materials are considered to be left in place without implementing ground improvement techniques, an assumed modulus of subgrade reaction of 50 pci can be used in the slab design. In either case, we recommend the floor slab thickness should not be thinner than 5 inches. If the project team elects to utilize aggregate piers at the project site for support of the shallow foundation system, consideration should also be given to supporting the slab-on-grade on interstitial aggregate piers installed in a grid pattern. We recommend that the project team discuss the use of interstitial aggregate piers with a specialty design-build contractor to evaluate the potential benefits and the associated costs.

We also recommend that the floor slab be underlain by a minimum of 6 inches of granular material having a maximum aggregate size of 1½ inches and no more than 2% soil fines passing the No. 200 sieve. This granular layer will facilitate the fine grading of the subgrade and help prevent the rise of water through the floor slab. Prior to placing the granular material, the floor subgrade should be free of standing water, mud, and frozen soil. Before the placement of concrete, a vapor barrier may be placed on top of the granular material to provide additional moisture protection. Welded-wire mesh reinforcement should be placed in the upper half of the floor slab and attention should be given to the surface curing of the slab in order to minimize uneven drying of the slab and associated cracking and/or slab curling. The use of a blotter or cushion layer above the vapor retarder can also be considered for project specific reasons. Please refer to ACI 302.1R04 *Guide for Concrete Floor and Slab Construction* and ASTM E 1643 *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs* for additional guidance on this issue.

For conventional slab-on-grade construction, we recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. For maximum effectiveness, temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper third of the slab thickness. The Wire Reinforcement Institute recommends the mesh reinforcement be placed 2 inches below the slab surface or upper one-third of slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R04 Guide for Concrete Floor and Slab Construction for additional information regarding concrete slab joint design.

Underslab Sub-Drainage

Based on the groundwater levels observed during the subsurface exploration, we do not anticipate a significant volume of water will persist at the slab subgrade elevation. It should be noted however that surface runoff and limited groundwater seepage may accumulate at the slab subgrade. As such, we recommend that positive drainage be implemented around the perimeter of the proposed structure to help reduce the potential for water accumulation under the floor slab and foundation elements, which could potentially weaken the bearing soils.

PROJECT CONSTRUCTION RECOMMENDATIONS

General Construction Considerations

We recommend that the subgrade preparation, installation of the foundations, and construction of slabs-on-grade and pavements be monitored by an ECS geotechnical engineer or his representative. Methods of verification and identification such as proofrolling, DCP testing and hand auger probe holes will be necessary to further evaluate the subgrade soils and identify unsuitable soils.

We recommend that installation and excavations of new foundations (including ground improvement and installation of aggregate piers or steel helical piers considered for the project) be monitored on a full-time basis by an ECS geotechnical engineer or his representative to verify that the ground improvement or foundation installation is in accordance with the specialty contractor's/designer's/manufacturer's requirements and soil bearing pressure and the exposed subgrade materials will be suitable for the proposed structures, and are consistent with the boring log information obtained during this geotechnical exploration. We would be pleased to provide these services.

If shallow foundations and conventional slabs-on-grade are utilized, the contractor should be prepared to over-excavate footing and slab-on-grade excavations at isolated locations (as necessary). Since localized areas of very loose/soft/unsuitable material may be present below the bearing elevation of foundations, we recommend that hand auger probes and/or DCP testing be performed to a depth below the foundation subgrade equivalent to ½ the footing width (i.e., ½ B), or a minimum of 3 feet below each isolated column footing and to at least 2 feet below continuous footings. Hand auger probes and/or DCP tests should be performed at each column footing and at approximately 20-foot intervals along continuous footings to verify the suitability of the soils to support the recommended maximum net allowable bearing pressure. The footings should be extended until suitable bearing soils are encountered or the unsuitable soils should be removed beneath the base of the footing and replaced with compacted engineered fill or lean concrete. If engineered fill is utilized, the engineered fill should be compacted to a minimum of 95 % of the maximum dry density in accordance with Modified Proctor Method, ASTM D 1557. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. If lean concrete is utilized to replace weaker/low bearing soils or unsuitable soils, no lateral over-excavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side), and the lean concrete should be allowed to harden prior to placement of the footing concrete.

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a period. Therefore, foundation concrete should be placed the same day that excavations are dug. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight or if rainfall comes, a 2 to 3 inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Construction Dewatering

Based on the groundwater conditions encountered at the project site, we do not anticipate that significant dewatering efforts will be required during mass removal and replacement of existing fill and conventional shallow foundation construction. It should also be noted that surface runoff may introduce water into the project site and excavations resulting from excavation activities. The general contractor should be prepared to remove accumulated water prior to the placement of fill and concrete. We anticipate that the removal of accumulated water can be achieved utilizing drainage trenches and a sump and pump system.

CCDD Environmental Testing

Please note that environmental soil sampling and analysis was not part of our scope of services. Given the nature of the soil conditions encountered at the project site and proposed construction, we anticipate that site preparation, earthwork and foundation excavation will likely result in removal and disposal of excavation spoils. As the property is commercial in nature, per Illinois Public Act 96-1416, soil sampling and analysis, along with certification from a licensed Professional Engineer that the soil is uncontaminated, will be required prior to clean construction and demolition debris (CCDD) or soils-only landfill acceptance. The sampling, analysis and certification process generally takes about 5 to 10 days to complete. To limit delays to the construction schedule, ECS recommends that consideration be given to proactively performing the requisite CCDD testing in advance of construction. This approach will accommodate same day "dig and haul activities" and could reduce overall costs and the potential for delay in the future. Please note that the total number of soil samples required will depend on site specific information (size, previous site use, neighboring property site use, amount of soil to be removed, etc.). If you have any questions, need additional information, or would like to schedule ECS to sample and analyze your material, please give us a call at 847-279-0366 and ask to speak to someone in the Environmental Department.

Closing

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and foundation characteristics. In the event that any change in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well known fact that variations in soil conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

In addition to geotechnical engineering services, ECS Midwest, LLC has the in-house capability to perform multiple additional services as this project moves forward. These services include the following:

- Environmental Consulting;
- Project Drawing and Specification Review;
- Construction Material Testing / Special Inspections; and,
- CCDD Environmental Testing

We would be pleased to provide these services for you. If you have questions with regard to this information or need further assistance during the design and construction of the project please feel free to contact us.

APPENDIX

General Location Map

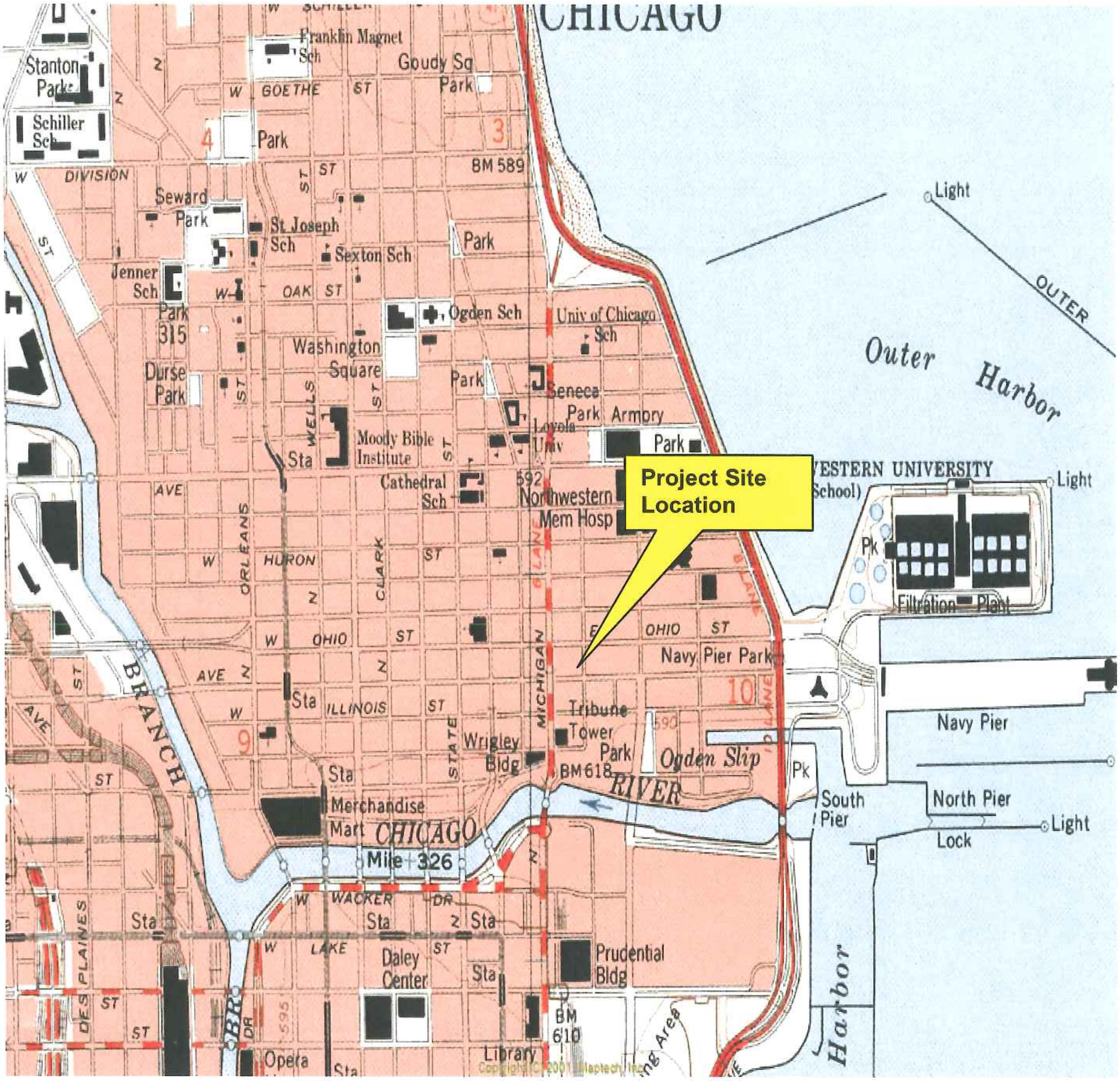
Boring Location Plan

Boring Logs

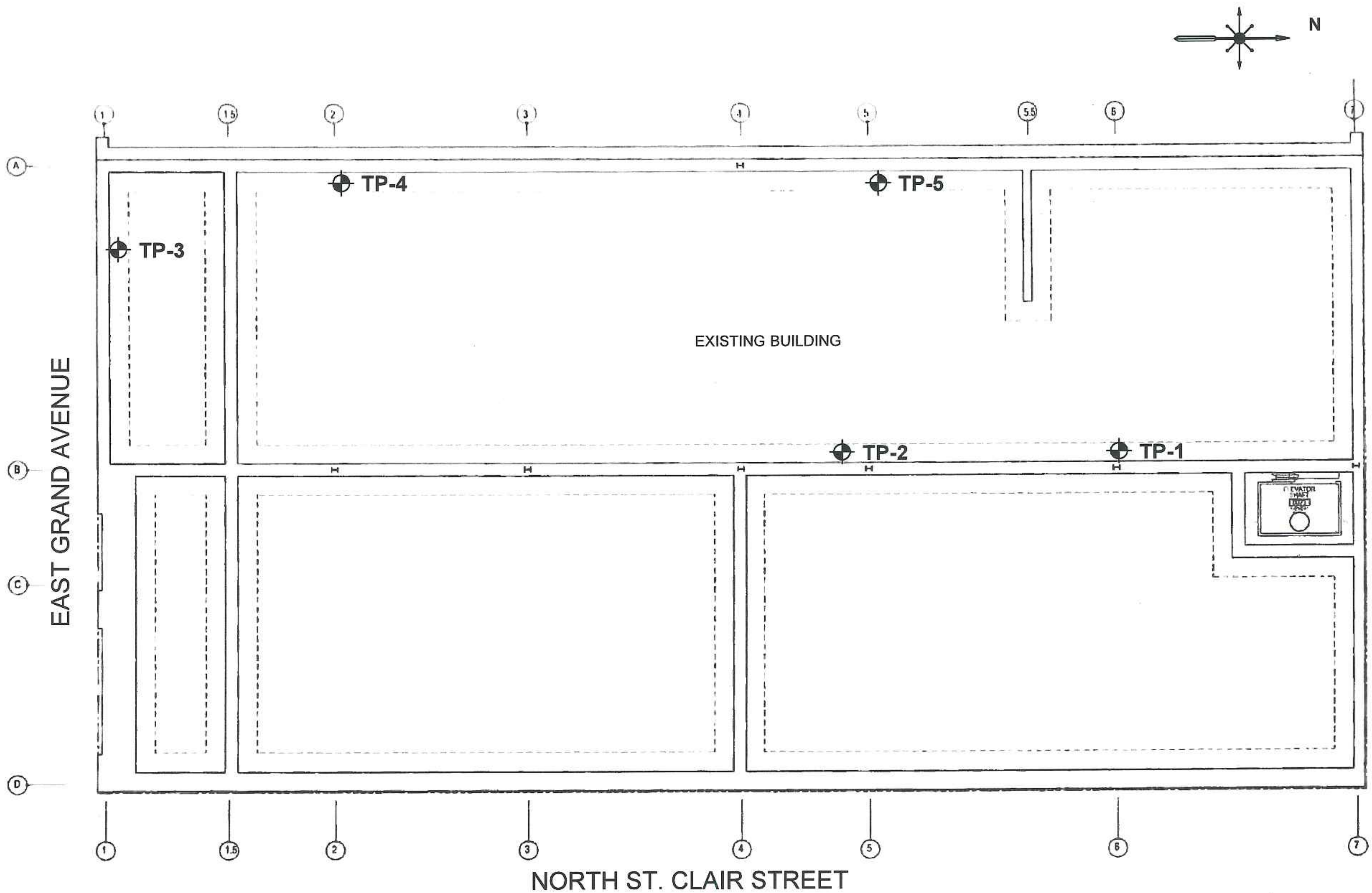
Pressuremeter Test Results

Unified Soil Classification System

Reference Notes for Boring Logs



ECS	**FIGURE 1** **GENERAL LOCATION MAP** **USGS Topographic Map** **Chicago Loop, IL Quadrangle** **Dated 1993** **Scale: Approx. 1" = 1,400'**	N	**ECS Project No. 16:9010** **Chef's Burger Bistro** **164 East Grand Avenue** **Chicago, Illinois**



APPROXIMATE HAND AUGER BORING LOCATION

BORING LOCATION PLAN

Chef's Burger Bistro Supplemental

Old Veteran Construction, Inc.

ENGINEER DAG	SCALE Approx. 1"=11'
DRAFTING LGM	PROJECT NO. 9010
REVISIONS	SHEET Figure 2
	DATE 5/22/12

PROJECT NAME:		AUGER HOLE #:
Chef's Burger Bistro Supplemental		TP-1
CLIENT: Old Veteran Construction, Inc.	JOB #: 16:9010	SURFACE ELEVATION: +14 CCD
LOCATION: 164 East Grand Avenue, Chicago, Illinois	ARCH./ENG.: T.R Knapp Architects/Larson Engineering	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Concrete Slab					
		Urban FILL (Sand, Gravel, Brick and Concrete Fragments), Brown, Dark Brown, Black and Red, Dry, Very Loose to Loose, (FILL)					
	10						
5			D				
	5	END OF HAND AUGER @ 9'					
10							
	0						
15							
	-5						
20							
	-10						
25							
	-15						
30							

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R:
Old Veteran Construction, Inc.	DG/MB	DG
MAKE:	MODEL:	DATE: 05/18/12
REACH:	CAPACITY:	UNITS:

PROJECT NAME:		AUGER HOLE #:
Chef's Burger Bistro Supplemental		TP-2
CLIENT: Old Veteran Construction, Inc.	JOB #: 16:9010	SURFACE ELEVATION: +14 CCD
LOCATION: 164 East Grand Avenue, Chicago, Illinois	ARCH./ENG: T.R Knapp Architects/Larson Engineering	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Concrete Slab					
		Urban FILL (Sand, Gravel, Brick and Concrete Fragments), Brown, Dark Brown and Red, Dry, Very Loose to Loose, (FILL) ,					
	10						
5							
			D	2, 5, 2, 0, 20			
	5	HAND AUGER REFUSAL @ 9'					
10							
	0						
15							
	-5						
20							
	-10						
25							
	-15						
30							

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R:
Old Veteran Construction, Inc.	DG	DG
MAKE:	MODEL:	DATE: 05/18/12
REACH:	CAPACITY:	UNITS:

ECS	PROJECT NAME: Chef's Burger Bistro Supplemental		AUGER HOLE #: TP-3
	CLIENT: Old Veteran Construction, Inc.	JOB #: 16:9010	SURFACE ELEVATION +14 CCD
	LOCATION: 164 East Grand Avenue, Chicago, Illinois	ARCH./ENG: T.R Knapp Architects/Larson Engineering	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Concrete Slab					
		Urban FILL (Sand, Gravel, Brick and Concrete Fragments), Dark Brown and Dark Gray, Dry to Moist, Very Loose to Loose (FILL)					
	10	Fine to Medium Sand FILL, With Gravel and Silt, Brown and Dark Brown, Moist, Very Loose, (FILL)	M	2, 2, 5, 5, 4, 4, SPT* 1,1,1,1			
5							
	5						
10							
		Fine SAND, Trace Gravel, Light Brown and Dark Brown, Moist, (SP)					
	0						
15		END OF HAND AUGER @ 15'					
	-5						
20							
	-10						
25							
	-15						
30							

REMARKS: SPT* - Converted SPT Blow Counts

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR: Old Veteran Construction, Inc.	OPERATOR: DG/MB/RBC	ECS ENG'R: DG
MAKE:	MODEL:	DATE: 05/18/12
REACH:	CAPACITY:	UNITS:

PROJECT NAME: Chef's Burger Bistro Supplemental		AUGER HOLE #: TP-4
CLIENT: Old Veteran Construction, Inc.	JOB #: 16:9010	SURFACE ELEVATION: +14 CCD
LOCATION: 164 East Grand Avenue, Chicago, Illinois	ARCH./ENG: T.R Knapp Architects/Larson Engineering	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Concrete Slab					
		Urban FILL (Sand, Gravel, Brick and Concrete Fragments), Dark Brown, Dry, Very Loose, (FILL)	E	3, 9, 7, 6, 4, 4,			
		END OF HAND AUGER @ 7.5'					

Depth scale (FT.): 0, 5, 10, 15, 20, 25, 30

Elevation scale (FT.): 10, 5, 0, -5, -10, -15

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR: Old Veteran Construction, Inc.	OPERATOR: MB	ECS ENG'R: DG
MAKE:	MODEL:	DATE: 05/18/12
REACH:	CAPACITY:	UNITS:

PROJECT NAME: Chef's Burger Bistro Supplemental		AUGER HOLE #: TP-5
CLIENT: Old Veteran Construction, Inc.	JOB #: 16:9010	SURFACE ELEVATION: +14 CCD
LOCATION: 164 East Grand Avenue, Chicago, Illinois	ARCH./ENG.: T.R Knapp Architects/Larson Engineering	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Concrete Slab					
		Urban FILL (Sand, Gravel, Brick and Concrete), Dark Brown, Brown, Red and Gray, Dry, Very Loose to Loose, (FILL)					
5	10						
		Fine to Coarse Sand and Gravel FILL, Trace Brick and Concrete, Brown and Dark Brown, Dry, (FILL)	VD				
10	5	HAND AUGER REFUSAL @ 9.00'					
15	0						
20	-5						
25	-10						
30	-15						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR: Old Veteran Construction, Inc.	OPERATOR: DG	ECS ENG'R: DG
MAKE:	MODEL:	DATE: 05/18/12
REACH:	CAPACITY:	UNITS:

ECS Midwest, LLC

Chicago, Illinois

Pressuremeter Testing Summary

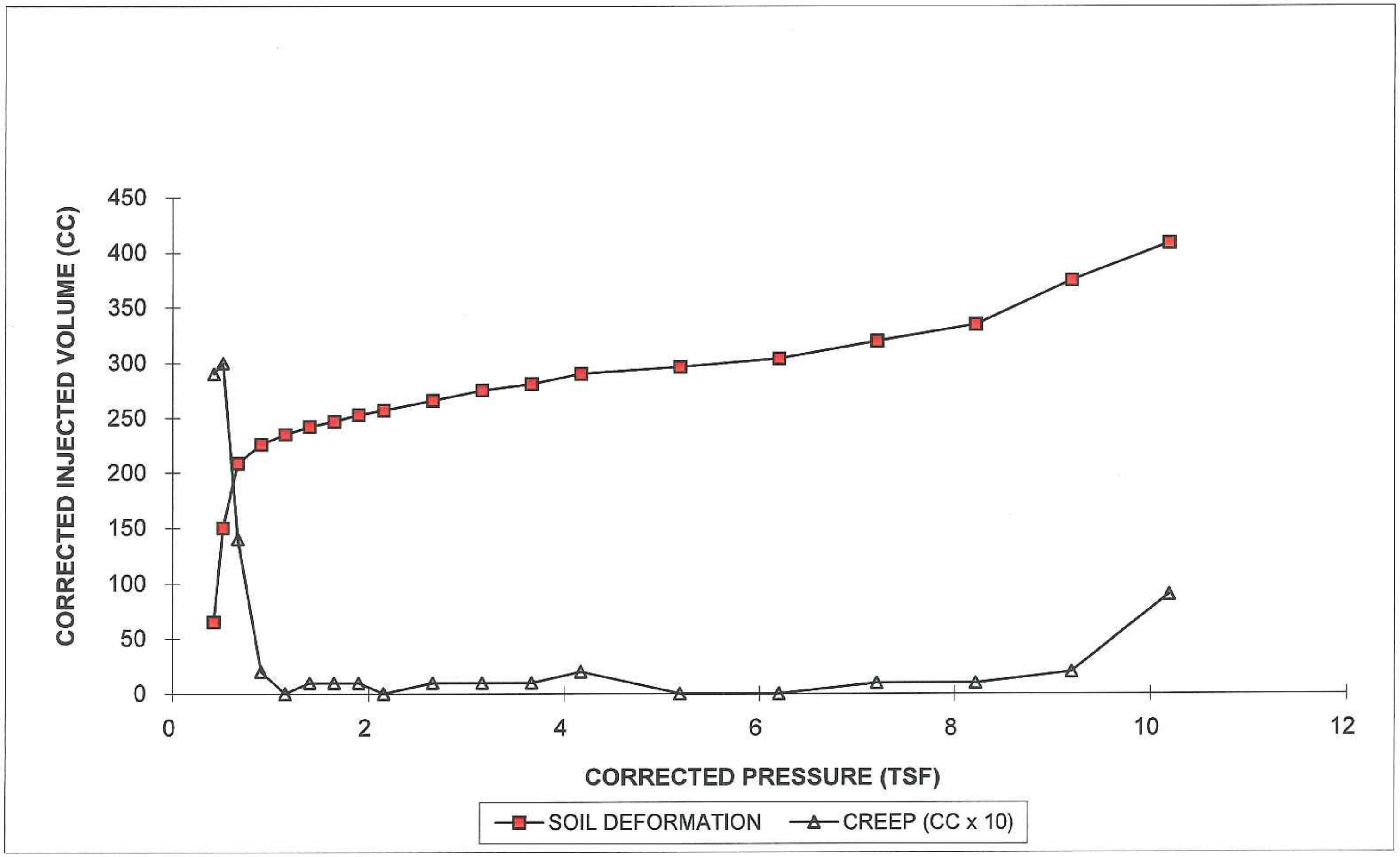
Date: 05/21/2012

Project Number: 16:9010 **Project Name:** Chef's Burger Bistro

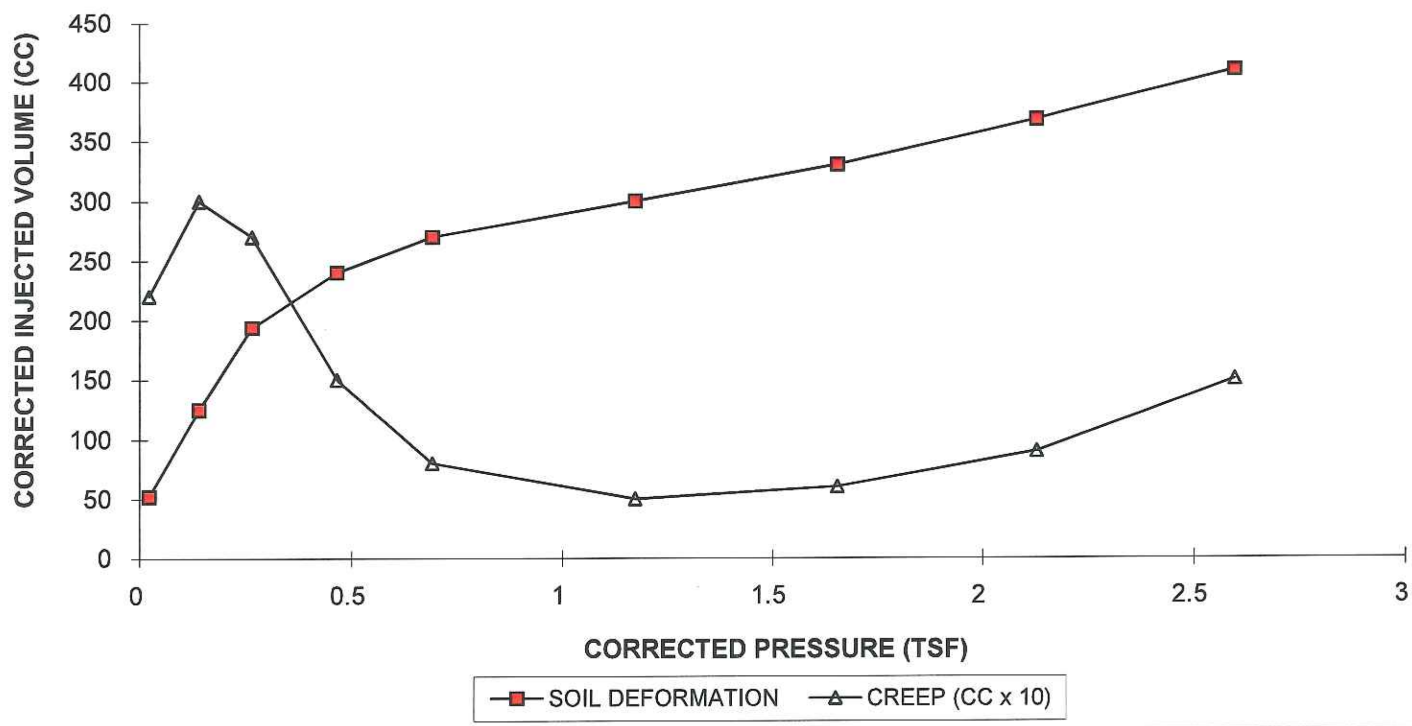
Project Engineer: DG **Principal Engineer:** BG **Summary By:** DG

Boring Number	Depth (feet)	Elevation (feet)	Depth to Water (feet)	Water Elevation (feet)	USCS	P_f	P_l	E_d	E_r	"N"	E_d / P_l	E_d / E_r	E_d / "N"	P_l / P_f
TP-3	13	+1 CCD	Dry	NA	SP	4	9	107		NA	11.89		NA	2.25
TP-1	5.5	+8.5 CCD	Dry	NA	FILL	1.6	3.5	34		NA	9.71		NA	2.19
TP-1	8	+6 CCD	Dry	NA	FILL	1.4	3	22		NA	7.33		NA	2.14

Notes:

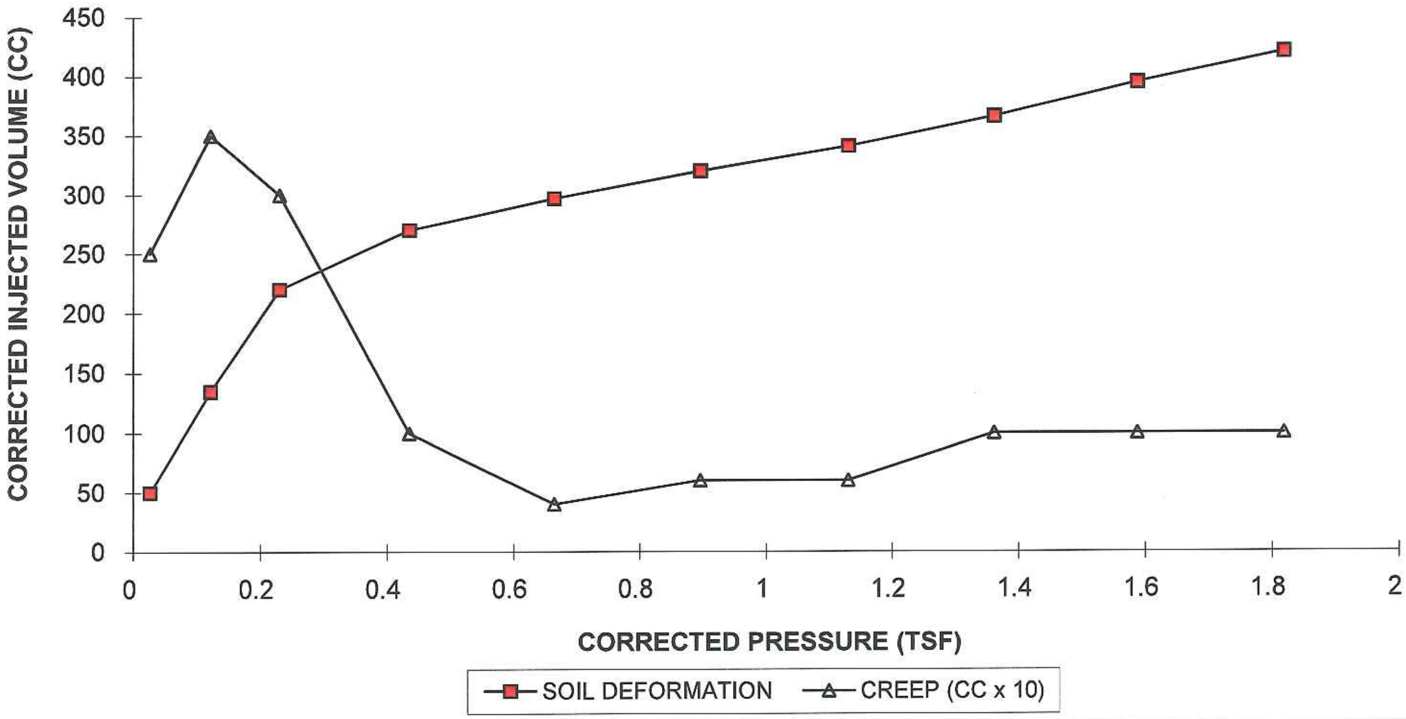


Boring No: TP-3		Depth: 13	
Soil Description: Fine Sand		"N": NA	
Classification: SP			
Project:	**Chef's Burger Bistro**	**ECS Midwest, LLC**	
Project No.:	**16:9010**	**Chicago, Illinois**	
Date:	**05/21/2012**	**Pressure Meter Data Reduction**	



Boring No:	TP-1	Depth:	5.5
Soil Description:	Miscellaneous FILL	"N":	NA
Classification:	FILL		

Project:	**Chef's Burger Bistro**	**ECS Midwest, LLC**
Project No.:	**16:9010**	**Chicago, Illinois**
Date:	**05/21/2012**	**Pressure Meter Data Reduction**

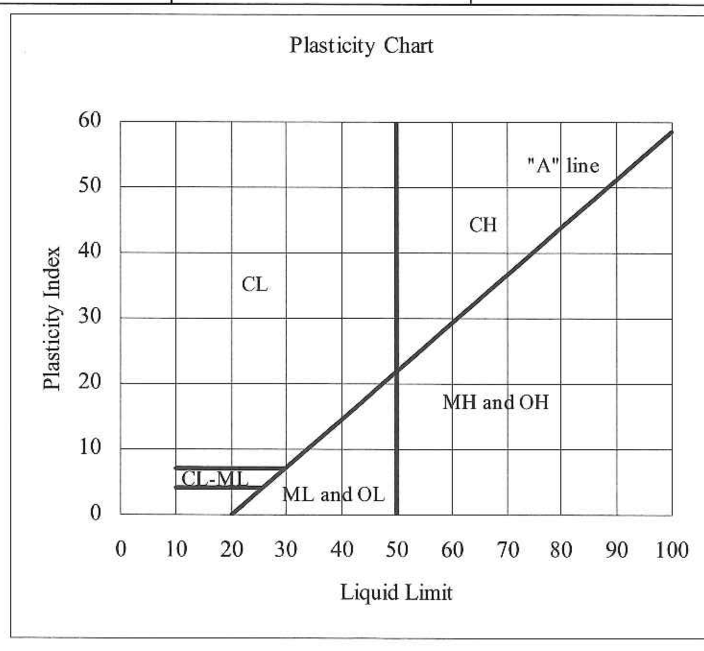


Boring No:	TP-1	Depth:	8
Soil Description:	Miscellaneous FILL	"N":	NA
Classification:	FILL		

Project:	**Chef's Burger Bistro**	**ECS Midwest, LLC**
Project No.:	**16:9010**	**Chicago, Illinois**
Date:	**05/21/2012**	**Pressure Meter Data Reduction**

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

Major Divisions			Group Symbols		Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 Sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols [b]	$C_u = D_{60}/D_{10}$ greater than 4 $C_c = (D_{30})^2/(D_{10} \times D_{60})$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or P.I. less than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ greater than 6 $C_c = (D_{30})^2/(D_{10} \times D_{60})$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in CL-ML zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller 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 sands, or clayey silts with slight plasticity	Plasticity Chart		
			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 silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly Organic soils		Pt		Peat and other highly organic soils			



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.
[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder. (From Table 2.16 - Winterkorn and Fang, 1975)

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▼	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.