CONSULTING GROUP

Report on Geotechnical Investigation

# Building Column Settlement Evaluation 1428-1430 West Hillgrove Avenue Western Springs, Illinois 60558

Latitude 41.807702˚ N
Longitude 87.909731˚ W

Prepared for:

Mr. Sam Girgis
506 Wennes Court
Oak Brook, Illinois 60523

G2 Project No. 172128
March 24, 2017

CONSULTING GROUP

March 24, 2017

Mr. Sam Girgis
506 Wennes Court
Oak Brook, Illinois 60523

Re: Report of Geotechnical Investigation
Building Column Settlement Evaluation
1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558
G2 Project No. 172128

Dear Mr. Girgis:

We have completed the geotechnical investigation building column settlement evaluation at your property in Western Spring, Illinois. This report presents the results of our field investigation, observations and analyses, and recommendations for foundation underpinning.

We appreciate the opportunity to be of service to you and look forward to discussing the recommendations presented herein. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please call us.

Sincerely,

**G2 Consulting Group, LLC**

Anthony L. Poisson, P.E.
Project Manager

Amy L. Schneider
Project Manager

LICENSED PROFESSIONAL ENGINEER
ANTHONY L. POISSON
057258
STATE OF ILLINOIS

3-24-17

ALP/ALS/jkg

Enclosures

g2consultinggroup.com

| | | | | |
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## EXECUTIVE SUMMARY

Recent building renovations included removing existing interior columns and replacing them with six (6) new columns - three (3) on each half of the building. The new columns are supported on individual spread footings. Upon removing temporary bracing, the southwest column footing reportedly settled 4 to 5 inches. Bracing was reinstalled to remove load from the new column. The purpose of our investigation is to determine the likely cause of settlement and to provide recommendations for support of the column. G2 Consulting Group, LLC (G2) previously performed a soil boring (B-1) extending to a depth of 10 feet in the northwest corner of the property on October 2016. This boring is included in the Appendix for reference only and our evaluation and recommendations for underpinning are based on borings B-2 and GP-3.

The Portland cement concrete floor slab is approximately 6 to 10 inches thick at the areas that had been saw cut and removed for the building renovation. Soil boring GP-3 was performed in an area that the floor slab had been removed and the ground surface was approximately 6 inches below the floor slab surface. Approximately 5 inches of bituminous pavement are present at boring B-2. Very loose silty sand fill is present below the bituminous pavement at boring B-2 and from the ground surface at boring GP-3 and extends to approximate depths of 3 to 4 feet. Soft peat and clayey marl underlie the silty sand fill and extend to approximate depths of 11 to 13 feet. Soft to stiff silty clay underlies the peat and marl and extends to an approximate depth of 22 feet in boring B-2 and to the explored depth of 15 feet in boring GP-3. Loose to medium compact gravelly sand extends from an approximate depth of 22 feet to the explored depth of 40 feet. Groundwater was encountered at an approximate depth of 22 and 2 feet in borings B-2 and GP-3 during drilling operations. Upon completion of drilling operations, the groundwater level at boring B-2 was measured at an approximate depth of 2 feet.

G2 observed the bearing plate had been unbolted from the southwest column and 4 inches of clear space were measured between the bottom of the bearing plate and top of footing. No measurable settlement at the remaining columns is apparent and the contractor did not report any movement of these columns after removing bracing. Additionally, G2 observed stair step cracking in the masonry walls. The observed cracks appear to range from 1/8 to 1/4 inch and have been recently patched. The cracking appears to be more predominantly along the south and west walls of the building and southern half of the interior bearing wall. Some floor slab cracks were also noted; however, differential movement appears to be relatively minor.

The existing fill soils and underlying soft organic peat and clayey marl are unsuitable for support of conventional shallow footings and floor slabs. The observed settlement at the southwest column location, stair step cracking of the masonry walls, and floor slab cracks are the result of consolidation of the soft organic peat and clayey marl due to foundation and floor slab loads.

Based on estimated column and wall loads and subsurface conditions, we recommend helical piles for supporting the southwest column and possible underpinning at the remaining column locations and bearing walls. We recommend helical piles bear on the medium compact gravelly sand at a minimum depth of 33 feet. An allowable soil bearing pressure of 8,000 pounds per square foot (psf) may be used for design of the helical piles bearing on the medium compact gravelly sand. Our allowable bearing pressure is based on a factor of safety of 3.

We understand the main concern is the southwest column footing. The contractor has indicated the footing will be removed to allow for installation of helical piles and a new pile cap. Although settlement was only observed at the southwest column, it is likely that excessive settlement will also occur at the remaining new column locations over time and we recommend underpinning these foundations with helical piles at the same time as the installation for the helical piles for the southwest column. If the budget is not currently available for underpinning the remaining columns, then column settlement should be monitored by a structural engineer at regular intervals for evidence of excessive settlement. We anticipate that it is highly likely that future underpinning of the new column foundations will be required at some point.

This summary is not to be considered separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analyses and recommendations are discussed in the following sections and in the Appendix of this report.

## PROJECT DESCRIPTION

We understand the existing building recently underwent structural renovations. The building is approximately 7,500 square feet with a slab-on-grade floor slab. Based on visual observations, the building has exterior concrete masonry unit (CMU) bearing walls with an interior CMU bearing wall running down the center of the building to divide the building into east and west halves. The renovations included removing existing interior columns and replacing them with six (6) new columns - three (3) on each half of the building. The new columns are supported on individual spread footing. The footings are 42 inches square, 16 inches thick, and bear at a depth of 16 inches below the existing floor slab. We understand the original columns were supported directly on the concrete floor slab. No information concerning column loading conditions was available at the time of this report. We anticipate maximum column loads range between 15 and 25 kips.

Upon removing temporary bracing, the southwest column footing reportedly settled 4 to 5 inches. Bracing was reinstalled to remove load from the new column. No noticeable settlement was observed at the other new column locations. Some movement of the floor slab and cracking in exterior masonry walls has also been reported.

G2 Consulting Group, LLC (G2) previously performed a soil boring (B-1) extending to a depth of 10 feet in the northwest corner of the property on October 2016. The soil boring was performed to evaluate groundwater conditions in conjunction with a proposed storm water volume control structure. Approximately 3 feet of silty clay are present at the soil boring. Soft black to medium peat and marl underlie the silty clay and extend to the explored depth of 10 feet. Groundwater was encountered at an approximate depth of 5 feet during drilling. Upon completion of drilling operations, groundwater was measured at an approximate depth of 6 feet. We have provided this soil boring in the Appendix for information purposes only. Our evaluation and recommendations for underpinning are based on borings B-2 and GP-3.

## SCOPE OF SERVICES

Field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We drilled two (2) soil borings within and adjacent to the existing building. Boring B-2 was extended to a depth of 40 feet. We originally planned to performed the soil boring adjacent to the southwest column; however, due to the low ceiling height, the driller was unable to perform split-spoon sampling and the boring was offset to the south side of the building. A second boring, GP-3, was performed in the interior of the building adjacent to the new northwest column using Geoprobe sampling procedures. Soil boring GP-3 extended to a depth of 15 feet.

2. We performed laboratory testing, including visual engineering classification, natural moisture content, dry density, and unconfined compressive strength determinations, on representative samples obtained from the soil borings.

3. We prepared this engineering report. Our report includes recommendations and soil design parameters for underpinning.

## FIELD OPERATIONS

G2 selected the number, depths, and locations of the soil borings in consideration of the areas of the building that showed signs of settlement. The soil borings were located in the field by a G2 engineer measuring from existing site features and landmarks using conventional taping methods. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1. Ground surface elevations at the soil boring locations were interpolated from the Site Grading Plan (Sheet C-3.0) prepared by W-T Civil Engineering, LLC, dated August 12, 2016.

The soil borings were drilled using a Geoprobe mounted rotary drilling rig. Continuous-flight, 2-1/4 inch inside diameter, hollow-stem augers were used to advance boring B-2 to the explored depth of 40 feet. Soil samples were obtained at intervals of 2-1/2 feet in the upper 10 feet and at intervals of 5 feet thereafter. These samples were obtained by the Standard Penetration Test Method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments, with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each six-inch increment and resulting N-values are presented on the boring log. At boring GP-3, the boring was advanced by pushing 5-foot plastic sleeves using rapid vibration.

The soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. During field operations, a G2 engineer maintained soil boring logs of the subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field logs supplemented by laboratory soil classification and test results. Soil boring B-2 was backfilled with auger cuttings and capped with concrete upon completion of drilling operations.

**LABORATORY TESTING**

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design and site preparation. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System.

Laboratory testing included natural moisture content, dry density, and unconfined compressive strength determinations. The unconfined compressive strengths were determined by ASTM Test Method D 2166 and using a spring loaded hand penetrometer. Per ASTM Test Method D 2166, the unconfined compressive strength of cohesive soils is determined by axially loading a small cylindrical soil sample under a slow rate of strain. The unconfined compressive strength is defined as the maximum stress applied to the soil sample before shear failure. If shear failure does not occur prior to a total strain of fifteen percent, the unconfined compressive strength is defined as the stress at a strain of fifteen percent. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring loaded cylinder.

The results of the laboratory tests are indicated on the boring logs at the depths the samples were obtained. The unconfined compressive strengths are also presented graphically on Figure No. 4 in the Appendix. We will hold the soil samples for 60 days from the date of this report, after which time they will be discarded. If you would like to retain the samples beyond that date, please let us know.

**SITE CONDITIONS**

The existing building is located at 1428-1430 West Hillgrove Avenue in Oak Park, Illinois. The building is a one-story warehouse structure located in the southern portion of the overall property. A smaller garage is located to the north of the warehouse building with an access drive extending south from Walker Street. A bituminous parking lot is present to the south of the warehouse building. A school and parking lot are located to the north of the overall property, a theatre to the east, railroad tracks to south, and a Western Springs public works facility to the west. The overall property appears to be relatively flat and surrounding properties also exhibit a relatively flat topography.

## SOIL CONDITIONS

The Portland cement concrete floor slab is approximately 6 to 10 inches thick at the areas that had been saw cut and removed for the building renovation. Soil boring GP-3 was performed in an area that the floor slab had been removed and the ground surface was approximately 6 inches below the floor slab surface. Approximately 5 inches of bituminous pavement are present at boring B-2. Silty sand fill is present below the bituminous pavement at boring B-2 and from the ground surface at boring GP-3 and extends to approximate depths of 3 to 4 feet. Peat underlies the silty sand fill and extends to approximate depths of 7 to 9 feet. Clayey marl is present below the peat and extends to approximate depths of 11 to 13 feet. Silty clay underlies the marl and extends to an approximate depth of 22 feet in boring B-2 and to the explored depth of 15 feet in boring GP-3. Gravelly sand extends from an approximate depth of 22 feet to the explored depth of 40 feet.

The silty sand fill at boring B-2 is very loose in compactness with a Standard Penetration Test N-value of 1 blows per 12 inches of penetration. A determination of the compactness of the silty sand fill at boring GP-3 could not be determined due to Geoprobe sampling methods. The peat is soft in consistency with natural moisture contents of 130 and 148 percent and an unconfined compressive strength of 500 psf. The underlying clayey marl is soft in consistency with natural moisture contents of 27 and 58 percent and unconfined compressive strengths of 500 psf. The silty clay extending to an approximate depth of 14-1/2 feet in boring B-2 and the explored depth of 15 feet in boring GP-3 is soft in consistency with natural moisture contents of 24 and 47 percent and an unconfined compressive strength of 500 psf. Below an approximate depth of 14-1/2 feet, the silty clay in boring B-2 is medium to stiff in consistency with natural moisture contents of 20 and 24 percent, a dry density of 110 pounds per cubic foot (pcf), and unconfined compressive strengths of 1,770 and 3,500 psf. The gravelly sand is loose to medium compact with N-values ranging between 9 and 21 blows per foot.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the boring logs on the basis of laboratory classification and testing, as well as field logs of the soils encountered.

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 3, and Unconfined Compressive Strength Test, Figure No. 4, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the boring logs and elsewhere in this report is presented on Figure No. 5.

## GROUNDWATER CONDITIONS

Groundwater was encountered at an approximate depth of 22 and 2 feet in borings B-2 and GP-3 during drilling operations, corresponding to approximate elevations of 621-1/2 and 641-1/2 feet. Upon completion of drilling operations, the groundwater level at boring B-2 was measured at an approximate depth of 2 feet, corresponding to an approximate elevation of 641-1/2 feet. The apparent rise in groundwater level at boring B-2 is likely the result of wet seams within the peat and marl that were sealed off with augers during drilling and not representative of an artesian condition. An accurate measurement of the groundwater level at boring GP-3 at completion of drilling could not be determined due to a collapse of the borehole after removal of Geoprobe sampling equipment.

Fluctuations in perched and long term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. Additionally, it should be noted that groundwater observations made during drilling operation in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

## OBSERVATIONS AND EVALUATION

Recent building renovations included removing existing interior columns and replacing them with six (6) new columns - three (3) on each half of the building. The new columns are supported on individual spread footings. The footings are 42 inches square, 16 inches thick, and bear at a depth of 16 inches below the existing floor slab. Upon removing temporary bracing, the southwest column footing reportedly settled 4 to 5 inches. Bracing was reinstalled to remove load from the new column.

While on site for drilling operations, G2 observed the bearing plate had been unbolted from the southwest column and 4 inches of clear space were measured between the bottom of the bearing plate and top of footing. No measurable settlement at the remaining columns is apparent and the contractor did not report any movement of these columns after removing bracing.

Additionally, G2 observed stair step cracking in the masonry walls. The observed cracks appear to range from 1/8 to 1/4 inch and have been recently patched. The cracking appears to be more predominantly along southern and western walls of the building and southern half of the interior bearing wall. Some floor slab cracks were also noted; however, differential movement appears to be relatively minor.

Groundwater at an approximate depth of 2 feet below floor slab elevation within an open excavation adjacent to the southwest column foundation. Additionally, concrete debris is present with excavation spoils that were removed during foundation excavation.

The existing fill soils and underlying soft organic peat and clayey marl are unsuitable for support of conventional shallow footings and floor slabs. The observed settlement at the southwest column location, stair step cracking of the masonry walls, and floor slab cracks are the result of consolidation of the soft organic peat and clayey marl due to foundation and floor slab loads.

## UNDERPINNING RECOMMENDATIONS

Typically, we would recommend deep foundations for new structures constructed above soft, organic soils; however, for existing structures, helical piles, resistance piers, and micropiles may be considered for underpinning options.

Based on expected column and wall loads and subsurface conditions, we anticipate helical piles will be the most economical solution for supporting the southwest column and possible underpinning at the remaining column locations and bearing walls. We recommend helical piles bear on the medium compact silty sand at a minimum depth of 33 feet. An allowable soil bearing pressure of 8,000 psf may be used for design of the helical piles bearing on the medium compact gravelly sand. Our allowable bearing pressure is based on a factor of safety of 3. An allowable pile capacity of 6 kips can be achieved with a 12-inch diameter helix bearing on the medium compact gravelly sand. Depending on actual column and wall loads, different size helixes may be used or multi-helix piles at the discretion of the structural engineer.

We understand the main concern is the southwest column footing. The contractor has indicated the footing will be removed to allow for installation of helical piles and a new pile cap. Although settlement was only observed at the southwest column, it is likely that excessive settlement will also occur at the remaining new column locations over time and we recommend underpinning these foundations with helical piles at the same time as the installation for the helical piles for the southwest column. If the budget is not currently available for underpinning the remaining columns, then column settlement should be monitored by a structural engineer at regular intervals for evidence of excessive settlement. We anticipate that it is highly likely that future underpinning of the new column foundations will be required at some point.

Additionally, continued cracking of the masonry bearing walls and floor slabs should be anticipated and periodic patching of the cracks will be required. If cracking becomes intolerable, consideration may also be given to underpinning the existing bearing wall footings to limit future movement and structurally supporting the floor slab with helical piles.

A State of Illinois licensed structural engineer must be retained to evaluate the existing structure, provide the design for the new southwest column foundation, and to provide the underpinning system and connections for stabilization of the existing footings at the column and wall locations, if needed.

The performance helical piles and the underpinning system is dependent on the quality of installation and the materials used. We recommend using a contractor with previous successful underpinning projects in the area. It should be noted some concrete debris was observed within spoils from excavation and removal of larger pieces of debris may be required to allow for installation of helical piles.

**GENERAL COMMENTS**

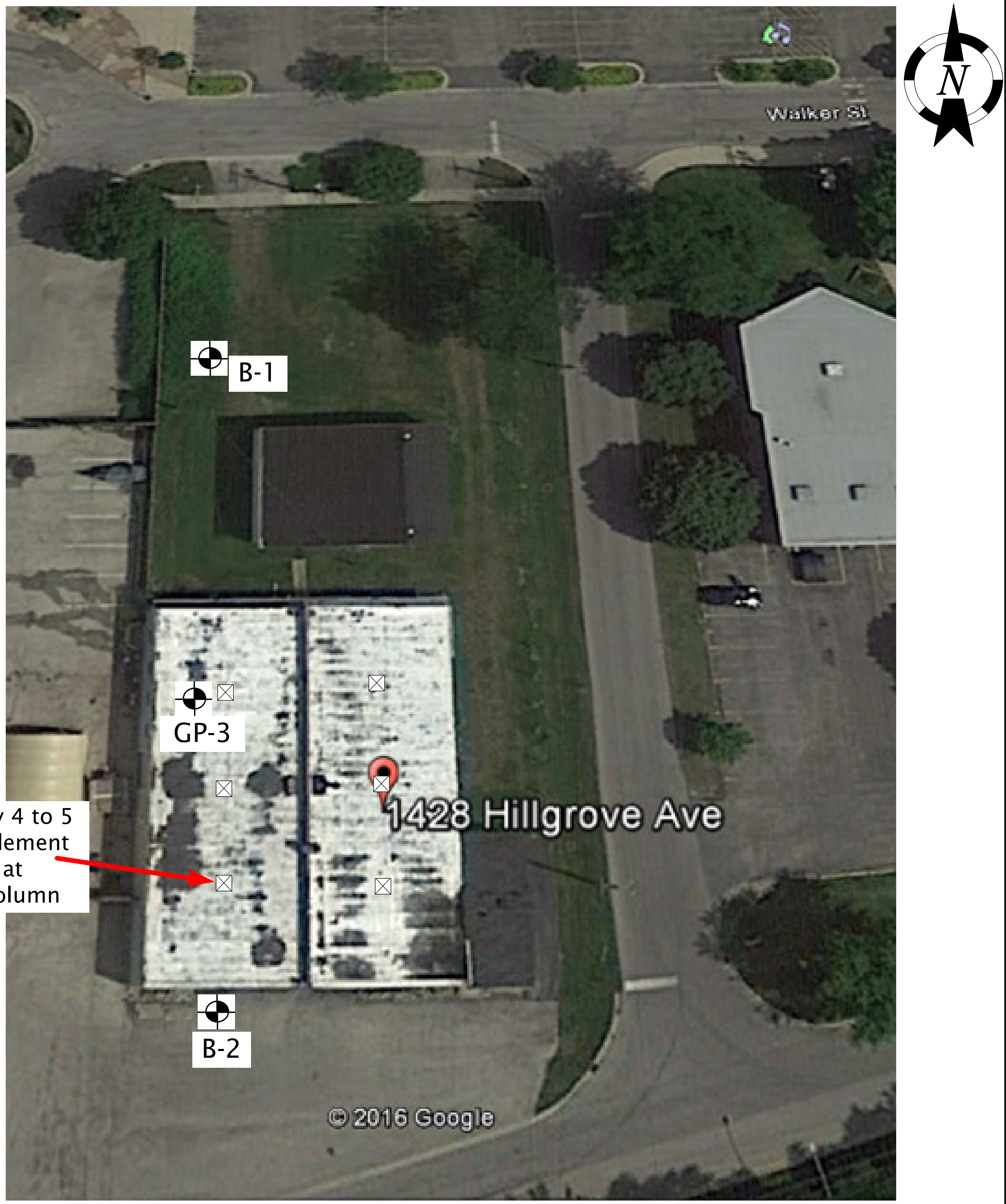
We have formulated the evaluations and recommendations presented in this report relative to engineered foundation support and underpinning operations on the basis of data provided to us relating to the existing foundations and the expected scope of the project. Any significant change in this data should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions. Furthermore, if changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

The scope of the present investigation was limited to evaluation of subsurface conditions and stabilizing the existing structure. No chemical, environmental or hydrogeological testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur away from the actual boring location. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Accordingly, we recommend G2 Consulting Group, LLC observe any underpinning operations. G2 Consulting Group, LLC will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

**APPENDIX**




## Legend

Soil Boring B-1 Drilled by Earth Solutions, Inc. on October 20, 2016 and Soil Borings B-2 and GP-3 Drilled by Earth Solutions, Inc. on March 22, 2017

New Column Locations

| Soil Boring Location Plan | | |
|---|---|---|
| Building Column Settlement Evaluation<br>1428 - 1430 West Hillgrove Avenue<br>Western Springs, Illinois 60558 | | |
| 2G CONSULTING GROUP | Project No. 172128 | |
| | Drawn by: ALP | |
| | Date: 3-23-17 | Plate No. 1 |
| | Scale: NTS | |

Project Name: Building Column Settlement Evaluation

Project Location: 1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558

G2 Project No. 172128

Latitude: N/A Longitude: N/A

# Soil Boring No. **B-1**

G2 CONSULTING GROUP

## SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 644.5 ft ±

| ELEV. (ft) | DEPTH (ft) | Description |
|---|---|---|
| | 0.1 | Fill: Gravel (2 inches) |
| | 3.0 | Stiff Gray Silty Clay with trace sand, gravel, and organic material |
| 639.5 | 5 | |
| | 8.0 | Soft to Medium Black Peat |
| 634.5 | 10.0 (10) | Soft Gray Marl with trace shell fragments |
| | | End of Boring @ 10 ft |
| 629.5 | 15 | |
| 624.5 | 20 | |
| 619.5 | 25 | |
| 614.5 | 30 | |
| 609.5 | 35 | |

## SOIL SAMPLE DATA

| SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|
| S-1 | 3 3 4 | 7 | 23.6 | | 2500* |
| S-2 | 1 1 1 | 2 | 101.7 | | 1000* |
| S-3 | W.O.H. | --- | | | |
| S-4 | W.O.H. | --- | 109.7 | | |

Total Depth: 10 ft
Drilling Date: October 20, 2016
Inspector:
Contractor: Earth Solutions, Inc.
Driller: Sal

Drilling Method:
2-1/4 inch inside diameter hollow-stem augers

Water Level Observation:
5 feet during drilling operation; 6 feet upon completion of drilling operations

Notes:
W.O.H. = Weight of Hammer
Borehole collapsed at 9 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Project Name: Building Column Settlement Evaluation

Project Location: 1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558

G2 Project No. 172128

Latitude: N/A Longitude: N/A

# Soil Boring No. **B-2**

G2 CONSULTING GROUP

## SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 643.5 ft ±

| Bottom Depth (ft) | Description |
|---|---|
| 0.4 | Bituminous Pavement (5 inches) |
| 3.0 | Fill: Very Loose Dark Brown Silty Sand with little gravel |
| 9.0 | Soft Dark Brown Peat |
| 11.0 | Soft Gray Clayey Marl wlth trace shell fragments |
| 14.5 | Soft Gray Silty Clay with trace sand and gravel |
| 22.0 | Medium to Stiff Gray Silty Clay with trace sand and gravel |
| | Loose to Medium Compact Gray Gravelly Sand with trace silt |

## SOIL SAMPLE DATA

| ELEV. (ft) | DEPTH (ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|---|---|
| | | S-1 | 3<br>1/12" | --- | | | |
| 638.5 | 5 | S-2 | W.O.H. | --- | | | |
| | | S-3 | 1/18" | --- | 147.6 | | 500* |
| 633.5 | 10 | S-4 | W.O.H. | --- | 27.0 | | 500* |
| | | S-5 | 0<br>0<br>4 | 4 | 23.8 | | 500* |
| 628.5 | 15 | S-6 | 0<br>2<br>3 | 5 | 19.6 | | 3500* |
| 623.5 | 20 | S-7 | 0<br>4<br>6 | 10 | 24.2 | 110 | 1770 |
| 618.5 | 25 | S-8 | 4<br>4<br>6 | 10 | | | |
| 613.5 | 30 | S-9 | 3<br>5<br>4 | 9 | | | |
| 608.5 | 35 | S-10 | 8<br>9<br>7 | 16 | | | |

Total Depth: 40 ft
Drilling Date: March 22, 2017
Inspector: B. Kouchoukos
Contractor: Earth Solutions, Inc.
Driller: Juan

Drilling Method:
2-1/4 inch inside diameter hollow-stem augers

Water Level Observation:
20 feet during drilling opertaions; 2 feet upon completion

Notes:
W.O.H. = Weight of Hammer
Borehole collapsed at 20 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and capped with cold patch

Figure No. 2a

Project Name: Building Column Settlement Evaluation

Project Location: 1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558

G2 Project No. 172128

Latitude: N/A Longitude: N/A

# Soil Boring No. **B-2**

G2 CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. (ft) | PRO-FILE | GROUND SURFACE ELEVATION: 643.5 ft ± | DEPTH (ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| 603.5 | | Loose to Medium Compact Gray Gravelly Sand with trace silt *(continued)* 40.0 | 40 | S-11 | 2<br>4<br>17 | 21 | | | |
| | | End of Boring @ 40 ft | | | | | | | |
| 598.5 | | | 45 | | | | | | |
| 593.5 | | | 50 | | | | | | |
| 588.5 | | | 55 | | | | | | |
| 583.5 | | | 60 | | | | | | |
| 578.5 | | | 65 | | | | | | |
| 573.5 | | | 70 | | | | | | |

Total Depth: 40 ft
Drilling Date: March 22, 2017
Inspector: B. Kouchoukos
Contractor: Earth Solutions, Inc.
Driller: Juan

Drilling Method:
2-1/4 inch inside diameter hollow-stem augers

Water Level Observation:
20 feet during drilling opertaions; 2 feet upon completion

Notes:
W.O.H. = Weight of Hammer
Borehole collapsed at 20 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and capped with cold patch

Figure No. 2b

Project Name: Building Column Settlement Evaluation

Project Location: 1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558

G2 Project No. 172128

Latitude: N/A Longitude: N/A

# Geo Probe No. **GP-3**

G2 CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 643.5 ft ± | DEPTH ( ft) | Probe Run Length ( ft) | SAMPLE TYPE/NO. | Depth ft From | Depth ft To | MOISTURE CONTENT (PERCENT) | UNCOF. COMP. ST. (PSF) |
| | | Fill: Brown Silty Sand (4.0) | | | | | | | |
| 638.5 | | Soft Dark Brown Peat (7.0) | 5 | | LS-1 | 0.0 | 5.0 | 129.7 | 500* |
| 633.5 | | Soft Gray Clayey Marl with trace shell fragments (13.0) | 10 | | LS-2 | 5.0 | 10.0 | | |
| | | | | | | | | 58.1 | 500* |
| | | | | | | | | 47.1 | 500* |
| 628.5 | | Soft Gray Silty Clay (15.0) | 15 | | LS-3 | 10.0 | 15.0 | | |
| | | End of Geo Probe @ 15 ft | | | | | | | |
| 623.5 | | | 20 | | | | | | |
| 618.5 | | | 25 | | | | | | |
| 613.5 | | | 30 | | | | | | |
| 608.5 | | | 35 | | | | | | |

Total Depth: 15 ft
Drilling Date: March 22, 2017
Inspector: B. Kouchoukos
Contractor: Earth Solutions, Inc.
Driller: Juan

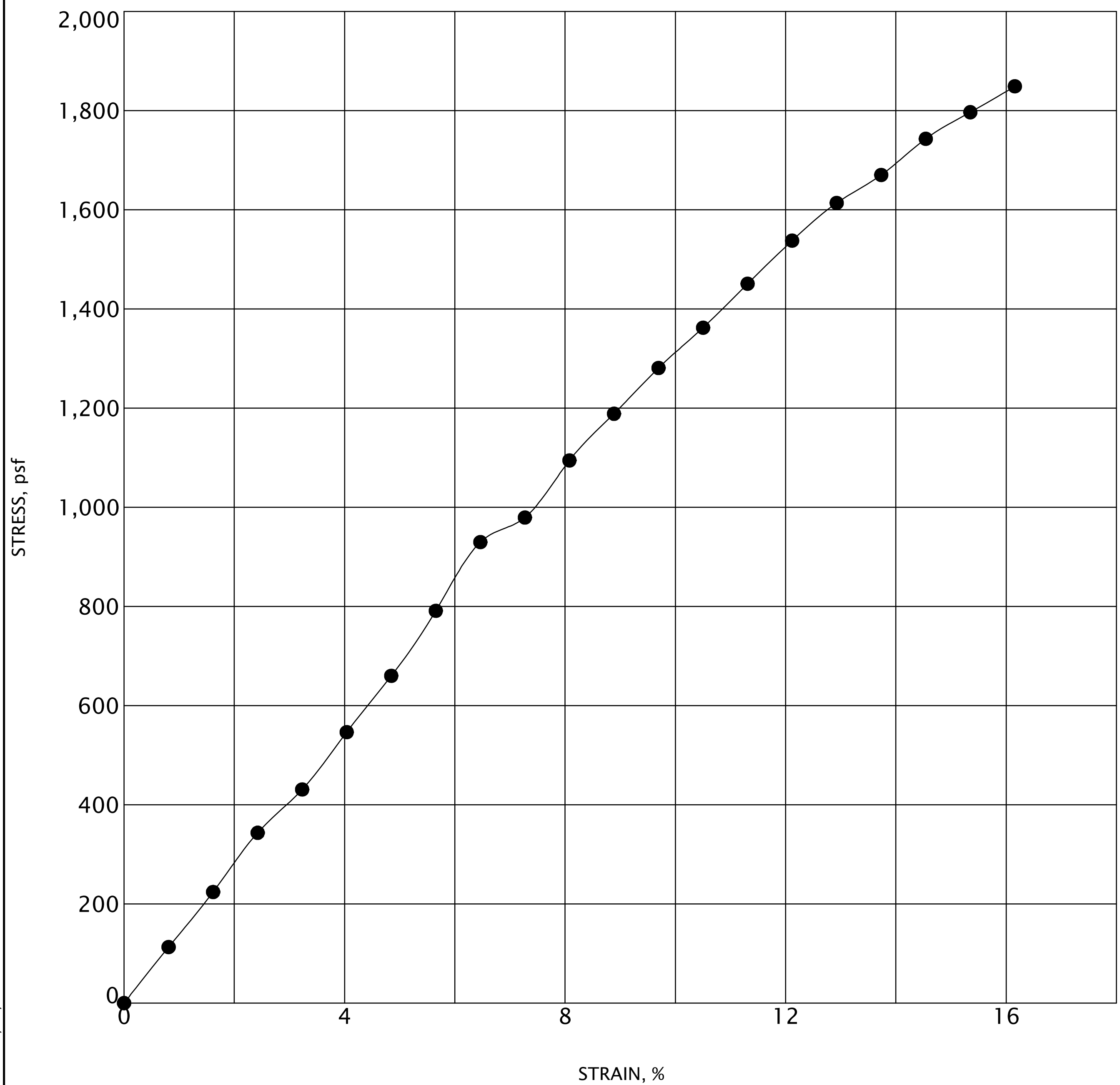
Drilling Method:
Geoprobe sampling sleeve

Water Level Observation:
2 feet during probing

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Collapsed at grade

Figure No. 3




| | Specimen | | Classification | MC% | $\gamma_d$ | UC |
|---|---|---|---|---|---|---|
| ● | B-2 | S-7 | Gray Silty Clay | 24 | 110 | 1770 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |



G2 CONSULTING GROUP

# UNCONFINED COMPRESSIVE STRENGTH TEST

Project Name: Building Column Settlement Evaluation

Project Location: 1428-1430 West Hillgrove Avenue
Western Springs, Illinois 60558

G2 Project No.: 172128

Figure No. 4

CONSULTING GROUP

# GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

## PARTICLE SIZE

| | | |
|---|---|---|
| Boulders | | - greater than 12 inches |
| Cobbles | | - 3 inches to 12 inches |
| Gravel | - Coarse | - 3/4 inches to 3 inches |
| | - Fine | - No. 4 to 3/4 inches |
| Sand | - Coarse | - No. 10 to No. 4 |
| | - Medium | - No. 40 to No. 10 |
| | - Fine | - No. 200 to No. 40 |
| Silt | | - 0.005mm to 0.074mm |
| Clay | | - Less than 0.005mm |

## CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

| Second Major Constituent (percent by weight) | Minor Constituent (percent by weight) |
|---|---|
| Trace - 1 to 12% | Trace - 1 to 12% |
| Adjective - 12 to 35% | Little - 12 to 23% |
| And - over 35% | Some - 23 to 33% |

## COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

| Consistency | Unconfined Compressive Strength (psf) | Approximate Range of (N) |
|---|---|---|
| Very Soft | Below 500 | 0 - 2 |
| Soft | 500 - 1,000 | 3 - 4 |
| Medium | 1,000 - 2,000 | 5 - 8 |
| Stiff | 2,000 - 4,000 | 9 - 15 |
| Very Stiff | 4,000 - 8,000 | 16 - 30 |
| Hard | 8,000 - 16,000 | 31 - 50 |
| Very Hard | Over 16,000 | Over 50 |

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

## COHESIONLESS SOILS

| Density Classification | Relative Density % | Approximate Range of (N) |
|---|---|---|
| Very Loose | 0 - 15 | 0 - 4 |
| Loose | 16 - 35 | 5 - 10 |
| Medium Compact | 36 - 65 | 11 - 30 |
| Compact | 66 - 85 | 31 - 50 |
| Very Compact | 86 - 100 | Over 50 |

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

## SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).