PL202400020
PL2024-20

Report of Geotechnical Exploration

405 86th Street West

Bloomington, Minnesota

April 13, 2016

Allied Project 16029

ITCO Allied Engineering Company

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Savage, Minnesota 55378

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SUBGRADE EXPLORATION

FOR

405 86TH STREET WEST

Bloomington, Minnesota

Allied Project No. 16029

April 13, 2016

INTRODUCTION

This report presents the results of subgrade exploration performed by our firm for a proposed commercial building. This work was requested by Mr. Chuck Plowe of Plowe Engineering, Inc. on March 29, 2016 and authorized by Mr. Michael Rancone of Moonview 86th Street, LLC on March 31, 2016. Our work was performed as described in our proposal for subgrade exploration dated March 30, 2016

PROJECT INFORMATION

The project site is located at 405 86th Street West, Bloomington, Hennepin County, Minnesota. A new 6000 square feet building, an infiltration pond and a pourous paver area are proposed.

BORING LOCATIONS AND ELEVATIONS

The borings were located as shown on the site plan included in the appendix. The boring locations were marked in the field by ITCO Allied Engineering Co. using dimensions scaled from the site plan. Ground elevations at the boring locations were estimated by interpolating the contour lines and spot elevations shown on the site plan.

FIELD EXPLORATION

Two Standard Penetration Test (SPT) borings for the building were each put down to a depth of 20 feet. Two additional SPT borings were each put down to ten feet of depth for the infiltration pond and pourous paver area. The borings were put down in accordance with ASTM 1586-99: "Standard Method for Penetration Test and Split-Barrel Sampling of Soils". Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140-lb weight falling a distance of 30 inches. After an initial set of 6", the number of blows required to drive the sampler an additional 12 inches is known as the standard penetration resistance or N-value. The N-value provides an indication of the relative density of cohesionless (coarse grained) soils or of the consistency of cohesive (fine-grained) soils.

As the samples were obtained in the field, they were visually and manually classified. Representative portions of the samples were then sealed in clean glass soil jars and returned to the laboratory for further examination and verification of the field classification. The recovered soil samples were classified in accordance with the Unified Soil Classification System, ASTM D: 2488-00. A chart illustrating this classification method is included in the appendix to this report. Logs of the test borings indicating the depth and identification of the various strata, measured penetration resistances, soil classifications and the results of water level checks are included in the appendix to this report.

Two bag samples were obtained from the two ten feet deep borings at 3'-5' in each boring. Gradation tests were done on each sample. The results are included in the appendix and discussed further in this report.

SUBSURFACE CONDITIONS

Boring B-1

Boring B-1 consisted of 14 inches of fine sand with some gravel, underlain by medium sand with silt to at least 1.5 feet of depth, fine sand from at least 2.5 feet to 5 feet of depth, sand to 10 feet of depth, and fine to medium sand to 11.5 feet of depth.

Boring B-2

Boring B-2 consisted of a layer of old asphalt, underlain by class 5 aggregate to at least 1.5 feet of depth, fine to medium sand from at least 2.5 feet to 5 feet of depth, and moist fine to medium sand to 11.5 feet of depth.

Boring B-3

Boring B-3 consisted of at least 18 inches of clayey sand, underlain by fine to medium sand to 5 feet of depth, fine sand to 7.5 feet of depth, sand with some gravel to 10 feet of depth, fine sand to 12.5 feet of depth, sand with some gravel to 15 feet of depth, and fine to medium sand to 21.5 feet of depth.

Boring B-4

Boring B-4 consisted of medium sand with clay to at least 1.5 feet of depth, underlain by fine sand from at least 2.5 feet to 5 feet of depth, moist fine sand to 7.5 feet of depth, fine sand to 10 feet of depth, fine to medium sand with some gravel to 15 feet of depth, fine to medium sand to 20 feet of depth, and sand with some gravel to 21.5 feet of depth..

N-values ranged from 8 to 19, indicating that the soils ranged from loose to medium dense in consistency. N-values of below 7 are considered low for commercial structures. There were no N-values below 7.

Groundwater was not encountered in any of the borings. Groundwater conditions may vary both seasonally and annually, based on precipitation amounts, patterns and both surface and subsurface drainage in the local area.

Included in the appendix to this report are logs of the test borings, which describe the conditions, encountered at each drilling location. The depth of the individual strata of soil may vary at and between the drilling locations due to unsampled intervals, the occurrence of transitions between soil layers and the natural variability of the subsurface conditions.

CONCLUSIONS AND RECOMMENDATIONS

Organic topsoil, peat, organic soils, and any soft soil layers, which may be encountered, should not be relied upon for support of the proposed commercial footings, slabs or controlled fills that will support these elements. These materials should be removed and replaced below the proposed

structure. A qualified soil technician should examine the excavated areas before suitable fill material is placed. ITCO Allied Engineering can provide this service during construction.

It should be possible to provide support for the planned structure with a conventional spread footing foundation system. If unsuitable soils are encountered, these can be corrected by using excavation and controlled refilling procedures together with an observational approach. This would require excavation in order to prepare for the placement of controlled fill to make grade for concrete for footings or slabs.

The non-root infested and inorganic on-site soils would generally be suitable for reuse as controlled and compacted fill material. The topsoil or other materials, which would not be suitable for use as controlled fill, may be able to be used as surface fill in the lawn and landscaping areas. Additional recommendations are presented in the following sections:

1. EXCAVATION

In general, grubbing and stripping operations should remove all significantly organic or root infested soils from the areas to be worked. Frozen material, soft consistency clays or otherwise unsuitable soil and debris should be removed. Where undocumented fill or otherwise unsuitable soils are exposed in the base of excavations, which will support slabs, pavements or footings, these materials should also be removed. Frozen soils resulting from frost penetration may turn soft upon thawing and would need to be removed.

For the support of fill sequences, slabs, or footings it will be important to remove unsuitable soils prior to the placement of the controlled and compacted fill to make grade for concrete foundations and slabs. Once the organic topsoil layers and otherwise unsuitable materials have been removed, the completed excavations should be observed by an experienced soil engineer or technician and the conditions judged to be suitable prior to the placement of controlled and compacted fill to make grade for concrete footings or slabs.

2. FOUNDATIONS

It should be possible to provide support for spread footing foundations systems using excavation and controlled filling procedures. As mentioned previously, the topsoil, peat, organic silt, organic

clay, soft clay, and any uncontrolled fill encountered during the excavation work should not be relied upon for support of footings, slabs or controlled fills which will support these elements. It will be important to monitor the conditions exposed in the excavations during the grading work prior to the placement of fill to make grade for concrete for footings or slabs. Hand auger borings and Dynamic Cone Penetrometer (DCP) tests should be done in the completed excavations and the exposed conditions judged suitable by an experienced soil engineer or technician prior to the placement of footings or fill. ITCO Allied Engineering Co. is capable of and available to do this work.

Once the recommendations presented in this report have been implemented, a net allowable bearing pressure of 2500 pounds per square foot may be utilized for the proportioning of individual footings. In designing the footings, it is recommended that they be designed to exert approximately equal pressures to the bearing strata. This should limit total and differential settlements to 1" and ½" respectively.

For frost protection, we recommend that footings in unheated areas be placed at a depth of 48 inches below finished grade. For decks and porches it is recommended that this be increased to 60 inches if the soil is frost susceptible. In heated portions of the buildings where frost susceptible materials are absent, a depth of 42 inches would be adequate. Where full or partial basements are utilized, frost depths for garage areas and porch structures should be maintained as outlined above.

3. FILL PLACEMENT

In the event that unsuitable soils are encountered and need to be replaced, the fill material should be mineral soil, preferably granular, and free of debris, boulders and organic material. The non-organic on-site soils would be suitable for reuse as controlled fill material provided that they are dry enough to meet compaction requirements. It may be difficult to dry wet soils sufficiently and it may be necessary to replace some of this material with off site material.

Fill should be placed and compacted in a manner that will allow complete compaction of the entire fill layer to a minimum of 95% of the Standard Proctor Density according to ASTM D: 698 in the building pad area. Required compaction should be increased to 98% for the top 4 feet of fill below final grade and below all footings. For roadway construction, the top 3 feet of roadway subgrade

should be compacted to 100%. A minimum of one representative field density test should be performed for each two feet of fill placed at a time in a given work area. Density tests in mass fill areas should be performed at a rate judged sufficient to represent the fill sequence as a whole. Where sand fills are to be compacted, smooth "drum" type vibratory equipment would be preferred, however, a sheepsfoot roller with short wide pads may provide adequate compaction.

Fill areas should be properly oversized to provide for adequate distribution of the imposed loads. The fill supporting structural elements should extend at least one foot horizontally beyond the structure, slab or edge of the footing. Fill surfaces should extend downward and outward on a 1:1 slope to competent soil. If the fill slope is unconfined by other soils, the downward and outward slope should be flattened and stabilized. Also, no unremedied excavations should be carried out within the fill oversize areas.

4. INFILTRATION POND AND POUROUS PAVER AREA

As stated previously, bag samples were obtained from the stormwater pond boring and pourous paver area at 3'-5' feet in each boring. The sieve analyses indicate that the material in boring B-1 is fine sand (SP) and from B-2 it is fine to medium sand (SP).

The Minnesota Pollution Control Agency's Guidelines for design infiltration rates were used to determine the design infiltration rates. These are as follows:

Boring	Sample	USC Classification	Soil Group & Infiltration Rate
B-1	3'-5'	Fine Sand, SP	A, 0.8 inches/hour
B-2	3'-5'	Fine to Medium Sand, SP	A, 0.8 inches/hour

5. FINAL SITE TOPOGRAPHY

The final soil surfaces should be graded to provide adequate drainage away from structures and pavements in order to minimize deleterious effects associated with water infiltration. The areas adjacent to footing walls should be adequately compacted (not loosely placed) and provided with drainage outlets to avoid this zone acting as a "sump" and creating nuisance water conditions.

Compliance with the building code provision for positive surface drainage away from the structure

should also aid in reducing the quantity of infiltration into the backfill zones adjacent to foundation walls.

STANDARD OF CARE

The recommendations contained in this report are professional opinions. These opinions were arrived at in accordance with generally accepted engineering practices currently in use at this time, location and for projects of this type. Other than this, no warranty is implied or intended. Soil samples recovered from the test borings will be retained in our offices for a period of thirty days from the date of this report. After that time they will be discarded unless prior written instructions to the contrary are received.

I hereby certify that this report and/or specification has been prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota. If you have any further questions or we can be of any further assistance, please do not hesitate to phone or write.

ITCO ALLIED ENGINEERING COMPANY

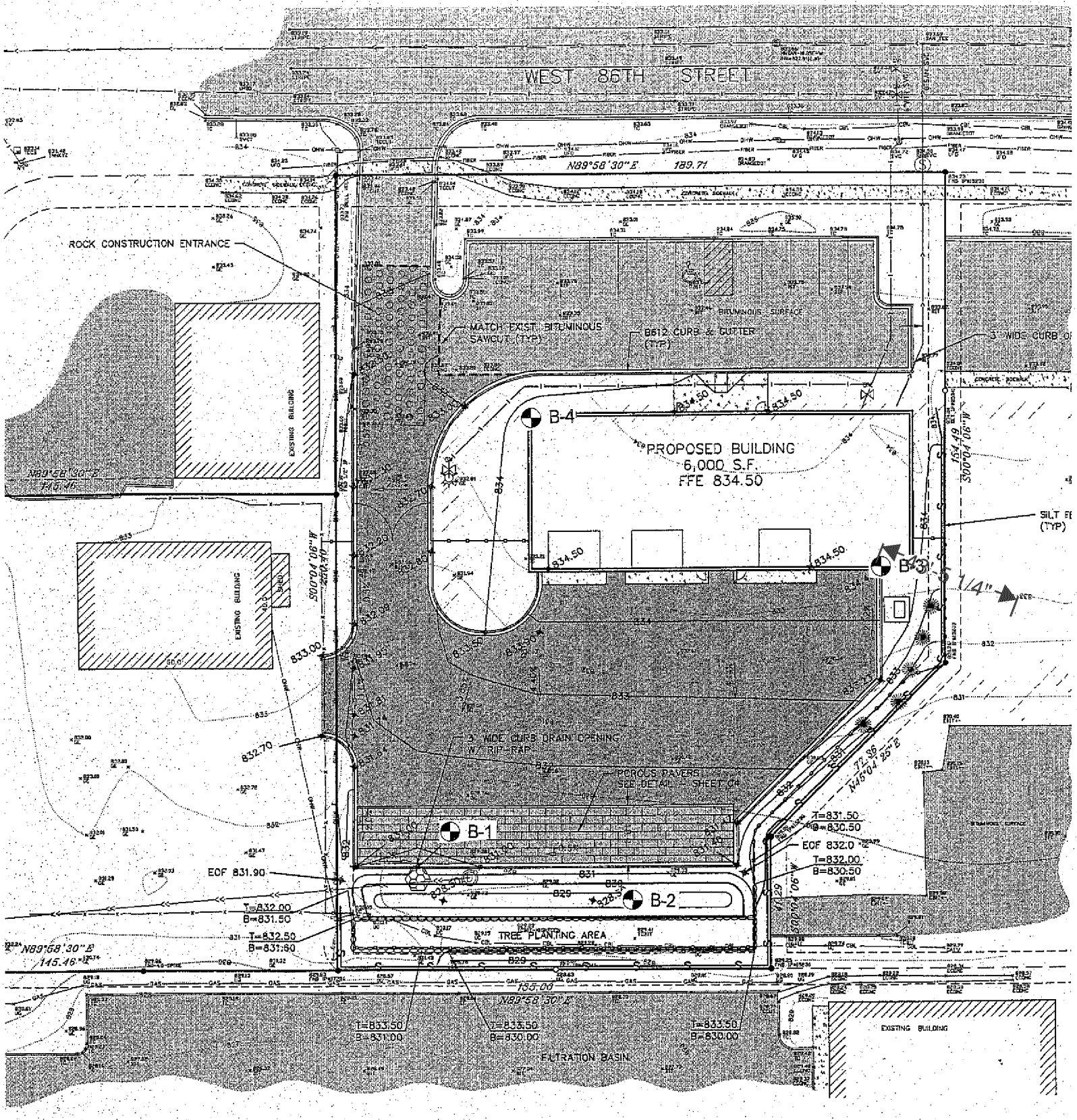
Robert Sullentrop

Robert Sullentrop, P.E.

Minnesota Registration No. 17823

APPENDIX A

Boring Location Plan


WEST 86TH STREET
N89°58'30"E 189.71
ROCK CONSTRUCTION ENTRANCE
MATCH EXIST. BITUMINOUS SAWCUT (TYP)
B612 CURB & GUTTER (TYP)
BITUMINOUS SURFACE
EXISTING BUILDING
PROPOSED BUILDING
6,000 S.F.
FFE 834.50
B-4
B-3
B-1
B-2
N89°58'30"E 145.46
S00°04'08"W 154.49
S00°04'08"W 300.00
N00°04'08"E 300.00
3' WIDE CURB DRAIN OPENING W/ RIP-RAP
POROUS PAVERS SEE DETAIL - SHEET C4
EOF 831.90
T=832.00
B=831.50
T=832.50
B=831.50
EOF 832.0
T=832.00
B=830.50
T=831.50
B=830.50
TREE PLANTING AREA
N89°58'30"E 145.46
N89°58'30"E 155.00
T=833.50
B=831.00
T=833.50
B=830.00
T=833.50
B=830.00
FILTRATION BASIN
EXISTING BUILDING
SILT FE (TYP)
3' WIDE CURB O
N45°04'25"E 72.36
N00°04'08"W 147.29

GRADI

APPENDIX B

Boring Logs

ITCO ALLIED ENGINEERING CO.

Project: 405 86th Street West

LOG OF BORING B-1
Sheet 1 of 4

DRILLER Mike
TECHNICIAN Tom

BORING NO. / LOCATION B-1
DRY ON COMPLETION ? Yes

DATE April 7, 2016
SURFACE ELEV. 829.5 FT.
REFUSAL No DEPTH ____ FT. ELEV. ____ FT.
SAMPLED 11.5 FT. 3.5 M

BORING TIME: 11:10 AM

BOTTOM OF HOLE DEPTH 10.0 FT. ELEV. 819.5 FT.
BORING ADVANCED BY: POWER AUGERING X

WATER LEVEL DATA (IF APPLICABLE)
DRILLING: DEPTH ____ FT. ELEV. ____ FT.
After 24 Hours DEPTH ____ FT. ELEV. ____ FT.
Cave-in DEPTH ____ FT.

STRATUM DEPTH FT.	STRATUM DEPTH ELEV.	SAMPLE DEPTH FROM FT.	SAMPLE DEPTH TO FT.	SAMPLE NUMBER	SAMPLE TYPE	FIELD RESULTS N-Value	FIELD RESULTS Qp	LABORATORY RESULTS LL	LABORATORY RESULTS PI	LABORATORY RESULTS %M	STRATUM DESCRIPTION
0.0	829.5	0.0	1.5	1	Grab						14" Light brown Fine Sand W/Some Gravel, SP
											Dk Brn Fn/Med Snd W/Silt, SP-SM
2.5	827.0	2.5	4.0	2	SS	8					Light Brown Fine Sand, SP
5.0	824.5	5.0	6.5	3	SS	12					Brown Sand, SW
7.5	822.0	7.5	9.0	4	SS	11					
10.0	819.5	10.0	11.5	5	SS	9					Brown Fine to Medium Sand, SP

REMARKS:

ITCO ALLIED ENGINEERING CO.

Project: 405 86th Street West

LOG OF BORING B-2

Sheet 2 of 4

DRILLER Mike

TECHNICIAN Tom

BORING NO. / LOCATION B-2

DRY ON COMPLETION ? Yes

DATE April 7, 2016

SURFACE ELEV. 829.4 FT.

REFUSAL: No DEPTH ____ FT. ELEV. ____ FT.

SAMPLED 11.5 FT. 3.5 M

BORING TIME: 12:10 PM

BOTTOM OF HOLE DEPTH 10.0 FT. ELEV. 819.4 FT.

BORING ADVANCED BY: POWER AUGERING X

WATER LEVEL DATA (IF APPLICABLE)

DRILLING: DEPTH ____ FT. ELEV. ____ FT.

After 24 Hours DEPTH ____ FT. ELEV. ____ FT.

Cave-in DEPTH 9.7 FT.

STRATUM DEPTH FT.	STRATUM DEPTH ELEV.	SAMPLE DEPTH FROM FT.	SAMPLE DEPTH TO FT.	SAMPLE NUMBER	SAMPLE TYPE	FIELD RESULTS N-Value	FIELD RESULTS Qp	LABORATORY RESULTS LL	LABORATORY RESULTS PI	LABORATORY RESULTS %M	STRATUM DESCRIPTION
0.0	829.4	0.0	1.5	1	Grab						Old Asphalt Class 5 Aggregate
2.5	826.9	2.5	4.0	2	SS	13					Brown Fine to Medium Sand, SP
5.0	824.4	5.0	6.5	3	SS	8					Moist Brown Fine to Medium Sand, SP
7.5	821.9	7.5	9.0	4	SS	10					
10.0	819.4	10.0	11.5	5	SS	13					

REMARKS:

ITCO ALLIED ENGINEERING CO.

Project: 405 86th Street West

LOG OF BORING B-3

Sheet 3 of 4

DRILLER Mike

TECHNICIAN Tom

BORING NO. / LOCATION B-3

DRY ON COMPLETION ? Yes

DATE April 7, 2016

SURFACE ELEV. 833.2 FT.

REFUSAL: No DEPTH ____ FT. ELEV. ____ FT.

SAMPLED 21.5 FT. 6.6 M

BORING TIME: 12:40 PM

BOTTOM OF HOLE DEPTH 20.0 FT. ELEV. 813.2 FT.

BORING ADVANCED BY: POWER AUGERING X

WATER LEVEL DATA (IF APPLICABLE)

DRILLING: DEPTH ____ FT. ELEV. ____ FT.

After 24 Hours DEPTH ____ FT. ELEV. ____ FT.

Cave-in DEPTH 18.5 FT.

STRATUM DEPTH FT.	STRATUM DEPTH ELEV.	SAMPLE DEPTH FROM FT.	SAMPLE DEPTH TO FT.	SAMPLE NUMBER	SAMPLE TYPE	FIELD RESULTS N-Value	FIELD RESULTS Qp	LABORATORY RESULTS LL	LABORATORY RESULTS PI	LABORATORY RESULTS %M	STRATUM DESCRIPTION
0.0	833.2	0.0	1.5	1	Grab						Dark Brown Clayey Sand, SC
2.5	830.7	2.5	4.0	2	SS	11					Brown Fine to Medium Sand, SP
5.0	828.2	5.0	6.5	3	SS	9					Brown/Grey Fine Sand, SP
7.5	825.7	7.5	9.0	4	SS	11					Brown/Grey Sand W/Some Gravel, SW
10.0	823.2	10.0	11.5	5	SS	19					Brown/Grey Fine Sand, SP
12.5	820.7	12.5	14.0	6	SS	18					Moist Brown Sand W/Some Gravel, SW
15.0	818.2	15.0	16.5	7	SS	8					Brown Fine to Medium Sand, SP
20.0	813.2	20.0	21.5	8	SS	14					

REMARKS:

ITCO ALLIED ENGINEERING CO.

Project: 405 86th Street West

LOG OF BORING B-4
Sheet 4 of 4

DRILLER Mike
TECHNICIAN Tom

BORING NO. / LOCATION B-4
DRY ON COMPLETION ? Yes

DATE April 7, 2016
SURFACE ELEV. 833.2 FT.
REFUSAL: No DEPTH ____ FT. ELEV. ____ FT.
SAMPLED 21.5 FT. 6.6 M

BORING TIME: 1:15 PM

BOTTOM OF HOLE DEPTH 20.0 FT. ELEV. 813.2 FT.
BORING ADVANCED BY: POWER AUGERING X

WATER LEVEL DATA (IF APPLICABLE)

DRILLING:	DEPTH	____ FT.
	ELEV.	____ FT.
After 24 Hours	DEPTH	____ FT.
	ELEV.	____ FT.
Cave-in	DEPTH	18.6 FT.

STRATUM DEPTH FT.	STRATUM DEPTH ELEV.	SAMPLE DEPTH FROM FT.	SAMPLE DEPTH TO FT.	SAMPLE NUMBER	SAMPLE TYPE	FIELD RESULTS N-Value	FIELD RESULTS Qp	LABORATORY RESULTS LL	LABORATORY RESULTS PI	LABORATORY RESULTS %M	STRATUM DESCRIPTION
0.0	833.2	0.0	1.5	1	Grab						Dark Brown Medium Sand W/Clay, SP-SC
2.5	830.7	2.5	4.0	2	SS	11					Brown Fine Sand, SP
5.0	828.2	5.0	6.5	3	SS	6					Moist Brown Fine Sand, SP
7.5	825.7	7.5	9.0	4	SS	8					Grey/Brown Fine Sand, SP
10.0	823.2	10.0	11.5	5	SS	11					Brown Fine to Medium Sand W/Some Gravel, SP
12.5	820.7	12.5	14.0	6	SS	14					
15.0	818.2	15.0	16.5	7	SS	11					Brown Fine to Medium Sand, SP
20.0	813.2	20.0	21.5	8	SS	18					Brown Sand W/Some Gravel, SW

REMARKS:

APPENDIX C

Labratory Test Results

ITCO ALLIED ENGINEERING CO.

AN ALLIANCE OF INSTANT TESTING COMPANY AND ALLIED TEST DRILLING
Jobsite and Laboratory Testing, Geotechnical Services, Commercial, Residential and Municipal
7125 West 126th Street, Suite #500 - Savage, MN 55378

Telephone: (952) 890-7366 Fax: (952) 890-5883

GRADATION TEST REPORT

Mr. David Kopfmann
Yardscapes, Inc.
405 86th Street West
Bloomington, Minnesota 55420

Re: 405 86th Street West Site

Date Sampled: 4-7-2016 Reported: 4-11-2016
Sample By: ITCO Allied Engineering Co. Project 16-029 Performed By: Kevin Matteson

Sieve Size	Lab. No.2016-060 % Passing	Lab. No.2016-061 % Passing
Boring No.	1	2
Sample Depth:	3' - 5'	3' - 5'
9.5mm=3/8"	100	100
4.75mm=#4	99	99
2.00mm=#10	99	97
850μm=#20	96	90
425μm=#40	82	67
180μm=#80	18	15
75μm=#200	4.8	6.4
Plastic Limit	Could Not Be Determined	Could Not Be Determined
Plasticity Index	NP	NP
AASHTO Soil Classification	A-3	A-3
Unified Soil Classification	SP	SP

Remarks:
Copies To:
Charge Codes: Gradation #103 – 2

Signed: _____
Gordon J. Kopacek, Professional Engineer – Registration No. 7254

APPENDIX D

Soil Classification System

ALLIED TEST DRILLING COMPANY SOIL CLASSIFICATION SYSTEMS

Unified Soil Classification System ASTM: D 2488-84

Major Divisions			Group Symbol	Typical Group Names
COARSE-GRAINED SOILS Granular soils More than 50% retained on the No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	Clean gravels < 5% passing No. 200 sieve	GW	Well-graded gravels, Well-grade gravel with sand[1]
			GP	Poorly-graded gravel, Poorly-graded gravel with sand[1]
		Gravel with fines >12% passing No. 200 sieve	GM	Silty gravel, Silty gravel with sand[1]
			GC	Clayey gravel, Clayey gravel with sand[1]
	SANDS 50% or more of coarse fraction passes No. 4 sieve	Clean sands < 5% passing No. 200 sieve	SW	Well-graded sand, Well-graded sand with gravel[2]
			SP	Poorly-graded sand, Poorly graded sand with gravel[2]
		Sand with fines >12% passing No. 200 sieve	SM	Silty sand, Silty sand with gravel[2]
			SC	Clayey sand, Clayey sand with gravel[2]
FINE-GRAINED SOILS Cohesive soils 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Silt, Silt with sand[3], Sandy silt[4]
			CL	Lean clay, Lean clay with sand[3], Sandy lean clay[4]
			OL	Organic silt, Organic clay
	SILTS AND CLAYS Liquid limit more than 50		MH	Elastic silt, Elastic silt with sand[3], Sandy elastic silt[4]
			CH	Fat clay, Fat clay with sand[3]
			OH	Organic clay, Organic silt
HIGHLY ORGANIC SOILS			PT	Peat

Boundary classifications are designated by dual group symbols. For example, (SP-SM) for Poorly-graded sand with silt.
[1]More than 15% sand [2]More than 15% gravel [3]15% to 30% retained on No. 200 sieve [4]30% retained on No. 200 sieve

AASHTO Soil Classification System

	Granular Materials (35% or less passing No. 200 sieve)							Silt-Clay Materials (>35% passing No. 200 sieve)				
	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-8
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7					
Sieve Analysis: Percent Passing												
No. 10	50 max											
No. 40	30 max	50 max	51 min									
No.200	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min	
Characteristics of Fraction Passing No. 40:												
Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min	
Plastic ~~limit~~ Index	6 max		NP	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min	
Usual Types of Significant Constituents	stone fragments gravel and sand		fine sand	silty or clayey gravel and sand				silty soils		clayey soils		Peat, highly organic soils
General Subgrade Rating	Excellent to good					Fair to poor						Unsatisfactory