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January 8, 2020

Hopper Condominium Association
C/O Conklin Associates
29 Church Street
Ramsey, NJ 07446

Re: Geotechnical Engineering Report
Proposed Retaining Walls
Durar Avenue
Ridgewood, NJ
JSC Job # 19-636

Johnson Soils Company, Inc. (JSC) has been retained by **Hopper Condominium Association** to perform a geotechnical investigation at the above referenced location as per our proposal dated November 4, 2019 and revised November 18, 2019. It includes JSC's findings, conclusions and recommendations related to the construction of the proposed retaining walls.

The site is located at the east end of Durar Avenue in Ridgewood, New Jersey. The areas are around the lower, middle, and upper detention ponds in the condominium community. The proposed features are shown on the plan entitled "Test Pit Location Plan." which was provided by **Conklin Associates**.

INVESTIGATION

Four (4) test pits were completed on November 20, 2019. The test pits were advanced using a mini excavator provided by others. Only four of the proposed ten test pits were done due to difficulties in access to the locations and the damage that would have been done to the landscape.

The test pit location plan and record sheet for each test pit are attached to this report.

FINDINGS

The explorations for this study indicate that the site is underlain by fairly uniform subsurface. The strata are listed below in order of increasing depth. Detailed descriptions of the subsurface conditions are shown on the individual "Logs of Test Pits," Plate 3A.

1. Fill: Layers of fill were encountered in TP-1 and TP-3. In TP-1 the fill was below the Topsoil to a depth of Four (4) feet below the ground surface. In TP-3 the fill was encountered from the surface to a depth of Eighteen (18) inches below the ground surface.
2. Topsoil: Layers of Topsoil were encountered from the surface ranging to a maximum depth of twelve (12) inches below the existing surface grade in TP-2. In TP-3 the Topsoil was found below the fill material to a depth of three (3) feet.
3. Sand & Silt (SM-ML): Layers of Sand & Silt were encountered below the Topsoil to depths of two feet four inches and four feet (2'4" & 4') below the existing surface grade in TP-2 and TP-3 respectively. In TP-4 the Silt, Some Sand was mixed in from three feet six inches to four feet (3'6" to 4').
4. Sand (SP): Layers of poorly graded Sand were encountered below the Sand and Silt to depths of six feet (6') below the existing surface grade in TP- 2 and TP-3.

Ground water was observed from three to four (3 to 4) feet below the existing surface grade in TP-1, TP-3, and TP-4 at the time of the investigation. It should be noted that the water level conditions may fluctuate due to variations in seasons, rainfall, temperature and other factors.

COMMENTS AND CONCLUSIONS

The Test Pits were completed in the areas of, or as close to, the proposed new retaining walls as possible.

The proposed retaining wall can be built on the Sand that was encountered in the deeper areas of the Test Pits and is the natural material in the area.

All excavations should be verified by a qualified geotechnical engineer at the time of the excavation to confirm the depth to suitable bearing material.

Please see the recommendations section for additional information.

It is anticipated that groundwater or detention pond water will enter the proposed excavations; this may be effectively controlled by one or more sump pits placed within or adjacent to the proposed excavations. The detention ponds may need to be pumped out during construction of the walls. It should be noted that the water level conditions may fluctuate due to variations in rainfall, temperature and other factors at the time of construction.

RECOMMENDATIONS

The following geotechnical design and construction recommendations are offered:

1. Foundation: **(The amounts in section (1a.) are minimums and may need to be increased due to slope stability requirements and/or any unforeseen conditions)**
 - a. Remove all misc. Fill and Sand and Silt under the retaining wall and into the entire grid zone down to the dense Sand (SP).
 - i. A minimum of twelve (12) inches of crushed stone (3/4" or 1 1/2") should be placed under the wall block to prevent remolding of soils.
 - A. The crushed stone base must extend a minimum of six (6) inches outside the proposed retaining wall block dimension.
 - b. Use an allowable bearing capacity of **two thousand five hundred (2,500) pounds per square foot (PSF)** on crushed stone on the Sand.
 - c. Maximum settlement is less than 1 in.
 - d. Estimated differential settlement is less than 0.5 in.
 - e. Minimum depth for frost protection is three feet (3') below the final exterior grade.
 - f. All concrete footings if used should be kept dry a minimum of forty-eight (48) hours after the footings are poured for proper curing.
 - g. Concrete blankets (or equivalent) are required if the temperature drops below thirty-two (32) degrees to prevent the concrete from freezing.
2. Retaining wall design information:
 - a. Sand (SP):
 - i. $\gamma = 120$ PSF
 - ii. $\phi = 28^\circ$
 - iii. $C = 0$
3. Soil Classification "C" as per OSHA 1926 Subpart P App A with maximum allowable slopes (H:V) of 1 1/2:1 as per OSHA 1926 Subpart P App B Table B-1.
 - a. This is for short-term maximum allowable slopes less than twelve (12) feet.
 - b. Sloping or benching for excavations greater than twenty (20) feet deep shall be designed by a Professional Engineer licensed in the State of New Jersey.

4. The Seismic Site Classification is "D" in terms of the International Building Code (IBC).
The profile is not considered to be susceptible to liquefaction.

- | | |
|-----------------------|-----------------------|
| a. $S_S = 0.277g$ | d. $S_{M1} = 0.174 g$ |
| b. $S_1 = 0.072 g$ | e. $S_{DS} = 0.291 g$ |
| c. $S_{MS} = 0.437 g$ | f. $S_{D1} = 0.116 g$ |

5. Types of Controlled FILL:

- a. The existing misc. Fill is **unsuitable** for use as backfill due to large cobbles and boulders.
- b. The existing onsite Sand & Silt are **extremely** difficult to reuse as backfill or controlled fill and are **NOT** recommended.
- c. The existing onsite Sand (SP) can be reused as backfill or controlled fill when used +/- 2% moisture content and approved by a geotechnical engineer at the time of use.
- d. Other Controlled Fill Options:
 - i. Crushed Stone at $\frac{3}{4}$ " or $1 \frac{1}{2}$ " size with no fines.
 - ii. Sand and Gravel with less than 20% passing the #200 sieve.
 - iii. Quarry Process Stone (QP) with less than 20% passing the #200 sieve

6. Controlled and Compacted Fill Requirements:

- a. A geotechnical engineer licensed in the state of New Jersey to inspect all earthwork operations.
- b. The contractor and/or owner shall notify the geotechnical engineer in writing a minimum of five (5) days prior to the start of all work on the project. The notification shall include all sources of Fill, equipment to be used, the estimated dates of the work and the proposed onsite supervisor.
- c. All misc. Fill and Topsoil shall be removed prior to the start of all earthwork operations.
- d. All Fill areas shall be proof rolled prior to the placement of any new Fill. All proof rolling shall be performed in the presence of the geotechnical engineer. Contractor shall use appropriately sized equipment for proof rolling (to be approved by the geotechnical engineer). If soft areas are found during the proof rolling process, the area shall be removed and replaced with compacted controlled Fill as per the direction of the geotechnical engineer.

- e. Any proposed Fill area shall be leveled before placement of any Fill. The area shall be free from ruts, hummocks or other uneven surfaces that would prevent uniform compaction.
- f. Use any of the material stated in the types of controlled Fill section or other material approved by the geotechnical engineer.
- g. A fifty pound (50-lb) bag of material shall be submitted to the geotechnical engineer for approval and testing a minimum of five (5) days prior to the start of work. No Fill material shall be placed until the geotechnical engineer has approved the material for use in the project.
- h. All controlled Fill should be placed in horizontal layers of eight to twelve (8-12) inches in loose thickness and be uniformly compacted to achieve a density of at least ninety-five (95) percent of the maximum dry density as determined by in the laboratory when tested in accordance with the most recent ASTM D1557 Standard.
- i. Backfill within confined areas should be placed in layers of six to eight (6-8) inches in loose thickness and compacted to the same 95% of maximum dry density using portable compaction equipment.
- j. No Fill material shall be placed, spread or compacted when the ground or Fill is frozen, thawing or during unfavorable weather conditions. When work is interrupted by heavy rain or frost, operations shall not be resumed unless the moisture content and density of the Fill are acceptable to the geotechnical engineer.
- k. A sufficient number of passes shall be approved by the geotechnical engineer in order to achieve the acceptable specified density above. A minimum of three (3) passes of pre-approved compaction equipment shall be required over all areas of each lift.
- l. Field density tests shall be made by the geotechnical engineer to determine the in-place field density in each layer placed. A minimum of one (1) test per one hundred (100) LF per lift of wall placed is required.
- m. No compacted Fill shall be placed over any layer that has not been previously approved by the geotechnical engineer. Should any of the tests find insufficient density, then additional compaction will be required until the required density is obtained.

7. The following construction tasks should be inspected by a geotechnical engineer using appropriate laboratory and field testing support:
- a. Confirm bottom of excavated area for all bottom of wall footings to the dense Sand (SP).
 - i. The estimated depth to suitable bearing material is approximately 3 to 4 feet from the existing grade. This might differ in areas we were unable to perform test pits in.
 - b. Geotechnical Engineer shall approve all types of controlled Fill material to be used behind the retaining wall.
 - c. Compaction of all controlled Fill behind the retaining wall.

The recommendations above are based on the data obtained from soil borings performed at the indicated specific locations and from other identified information. This report does not reflect any variations which may occur across the site apart from the Test Pits. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to re-evaluate the recommendations of this report.

This report has been prepared for the specific application to the project noted. In the event that there are changes in the nature, design or locations of the proposed structures, the conclusions and recommendations contained herein are not valid unless the changes are reviewed and the recommendations modified in writing by JSC.

The information and opinions rendered in our report are exclusively for use by **Hopper Condominium Association C/O Conklin Associates** and JSC will not distribute or publish this report without written consent except as required by law or court order. The information and opinions expressed in this report are given in response to a limited assignment and should be considered and implemented only in light of that assignment. The services provided by JSC in completing this project were consistent with normal standards of the profession. No warranty, expressed or implied, is made.

The following Plates are attached to this report:

Plate 1 -	Site Location Map
Plate 2 -	Test Pit Location Plan
Plate 3-	Logs of Test Pits
Plate 4 -	Unified Soil Classification System

Very truly yours,

JOHNSON SOILS COMPANY



Lisa V. Mahle-Greco, P.E.

Engineering Manager

NJ Lic. No. 43197

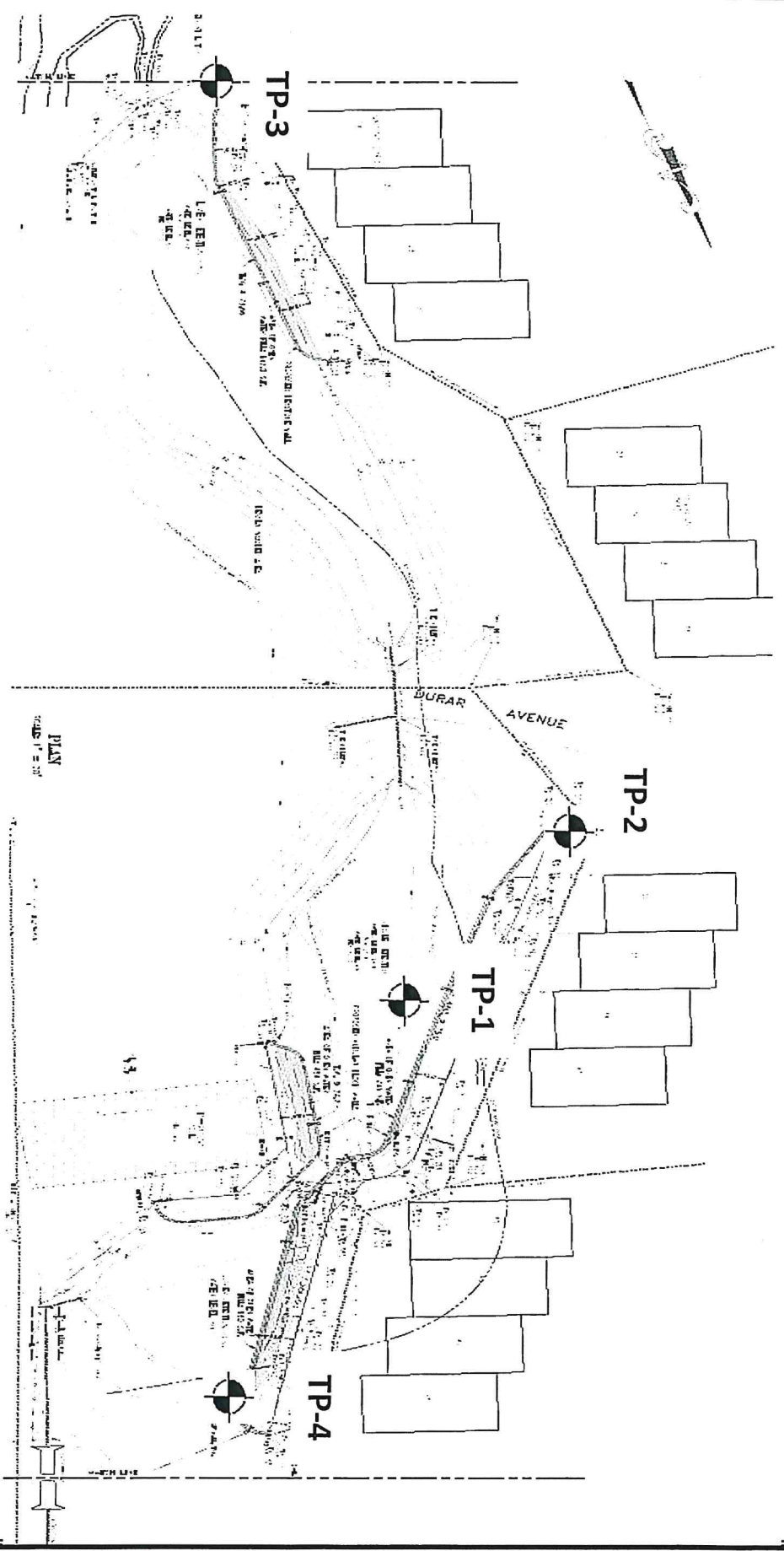


Site Location Plan

Hopper Condominium, Durar Ave
Ridgewood, NJ

JSC #19-636

PLATE 1



Scale: N.T.S.



Test Pit Location Plan

Hopper Condominium Durar Avenue
Ridgewood, NJ

JSC #19-636

PLATE 2



Hopper Condominium Assoc. – C/O Conklin Assoc.
Durar Avenue
Ridgewood, NJ

Date: November 20, 2019
Inspected by: J O'D
JSC Job # 19-636

Log of Test Pits

TP-1

0" - 2"	Topsoil
2" - 4'	Fill - Brown Fine to Medium Sand, some Silt & Gravel with numerous Cobbles
	Refusal on cobbles and boulder at 4'
	Water at 4'

TP-2

0" - 1'	Topsoil
1' - 2'4"	Yellow Brown Sand & Silt
2'4" - 6'	Brown Fine to Medium Sand, little Gravel & Silt
	No Water

TP-3

0" - 18"	Fill - Sand & Silt
18" - 3'	Topsoil
3' - 4'	Grey and Yellow Brown Sand & Silt
4' - 6'	Brown Fine to Medium Sand, little Silt & Gravel
	Water at 3'7"

TP-4

0" - 6"	Topsoil
6" - 3'6"	Brown Sand, little Gravel & Silt
3'6" - 4'	Grey Brown Silt, some Sand
	Water Seeping at 3'



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UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SAND AND SANDY SOILS		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
		CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY-SANDS LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS LITTLE OR NO FINES
FINE GRAINED SOILS	SAND AND SANDY SOILS	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT <u>LESS</u> THAN 50	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDS CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
HIGHLY ORGANIC SOILS	SILTS AND CLAYS	LIQUID LIMIT <u>GREATER</u> THAN 50	CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

GRADUATION*

% FINER BY WEIGHT

TRACE.....0% TO 10%
LITTLE.....10% TO 20%
SOME.....20% TO 35%
AND.....35% TO 50%

VALUES ARE FROM LABORATORY OR FIELD TEST DATA WHERE APPLICABLE WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

COMPACTNESS* SAND AND/OR GRAVEL

RELATIVE DENSITY

LOOSE.....0% TO 40%
MEDIUM DENSE.....40% TO 70%
DENSE.....70% TO 90%
VERY DENSE.....90% TO 100%

CONSISTENCY* CLAY AND/OR SILT

RANGE OF SHEARING STRENGTH IN POUND PER SQUARE FOOT

VERY SOFT.....LESS THAN 250
SOFT.....250 TO 500
MEDIUM.....500 TO 1000
STIFF.....1000 TO 2000
VERY STIFF.....2000 TO 4000
HARD.....GREATER THAN 4000