SYMBOL	DESCRIPTION
	PROPERTY LINE
	ADJACENT PROPERTY LINE
	BENCHMARK LOCATION
	UTILITY POLE
	GUY WIRE
— OH —	OVERHEAD WIRE
	WATER LINE
	GAS LINE
	EXISTING TREE
	STORMWATER INLET
	GAS VALVE
	WATER VALVE
	FIRE HYDRANT
	UNIDENTIFIED MANHOLE
	WATER WELL

SURVEY NOTES:

1. THE SURVEYS LISTED WITHIN THE PLAN REFERENCES ON THE COVER SHEET SHALL BE CONSIDERED A PART OF THIS PLAN SET AND ALL INFORMATION CONTAINED WITHIN THE SURVEY AND ASSOCIATED DOCUMENTS SHALL BE UTILIZED IN CONJUNCTION WITH THIS PLAN SET. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN A COPY OF THE SURVEY AND REVIEW IT THOROUGHLY PRIOR TO THE START OF CONSTRUCTION.

40' 0' 40' 80'

GRAPHIC SCALE IN FEET

1" = 40'

ISSUE	DATE	BY	DESCRIPTION
00	02/24/2023	SPM	FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design

Rutherford, NJ · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Detroit, MI
www.stonefieldeng.com

Headquarters: 92 Park Avenue, Rutherford, NJ 07070
Phone 201.340.4468 · Fax 201.340.4472

PRELIMINARY AND FINAL MAJOR SITE PLAN

522 VALLEY ESTATES, LLC

PROPOSED TOWNHOUSE DEVELOPMENT

BLOCK 32.01, LOT 12
522 VALLEY ROAD (COUNTY ROUTE 621)
CITY OF CLIFTON
PASSAIC COUNTY, NEW JERSEY

AFTON M. SAVITZ, P.E.
NEW JERSEY LICENSE No. 57674
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

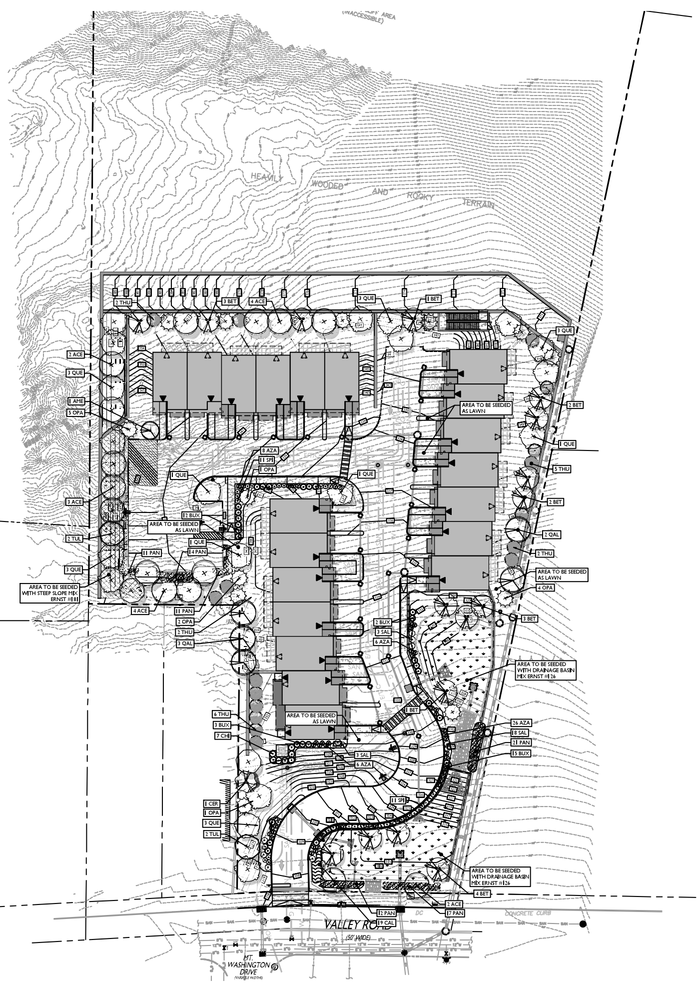
SCALE: 1" = 40' PROJECT ID: RUT-220013

TITLE:

EXISTING CONDITIONS PLAN

DRAWING:

C-2



PLANT SCHEDULE

DECIDUOUS TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	ACE	15	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	4" - 4.5" CAL	B&B
	BET	16	BETULA ALLEGHANIENSIS	YELLOW BIRCH	4" - 4.5" CAL	B&B
	CER	1	CERCIS CANADENSIS	EASTERN REDBUD MULTI-TRUNK	6' - 7' HT	B&B
	TUL	4	LIRIODENDRON TULIPIFERA	TULIP POPLAR	4" - 4.5" CAL	B&B
	QAL	5	QUERCUS ALBA	WHITE OAK	2.5" - 3" CAL	B&B
	QUE	19	QUERCUS PHELLOS	WILLOW OAK	4" - 4.5" CAL	B&B
EVERGREEN TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	OPA	13	ILEX OPACA 'JERSEY KNIGHT'	JERSEY KNIGHT AMERICAN HOLLY	6' - 7' HT	B&B
	CHI	7	JUNIPERUS CHINENSIS 'SPARTAN'	SPARTAN JUNIPER	6' - 7' HT	B&B
	THU	17	THUJA X 'GREEN GIANT'	GREEN GIANT ARBORVITAE	6' - 7' HT	B&B
FLOWERING TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	AME	1	AMELANCHIER CANADENSIS	SHADBLOW SERVICEBERRY MULTI-TRUNK	6' - 7' HT	B&B
SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	AZA	46	AZALEA X 'DELAWARE VALLEY WHITE'	VALLEY WHITE AZALEA	24" - 30"	POT
	SAL	24	SALIX PURPUREA 'NANA'	DWARF ARCTIC WILLOW	24" - 30"	POT
	SPI	22	SPIRAEA X BUMALDA	BUMALD SPIRAEA	24" - 30"	POT
EVERGREEN SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	BUX	32	BUXUS MICROPHYLLA 'WINTERGREEN'	WINTERGREEN BOXWOOD	18" - 24"	B&B
SHRUB AREAS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	CAL	19	CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER'	FEATHER REED GRASS	5 GAL POT	30" o.c.
	PAN	86	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	3 GAL POT	40" o.c.

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN ON THE LANDSCAPE PLAN AND WITHIN THE PLANT LIST, THE PLAN SHALL DICTATE.

LANDSCAPING AND BUFFER REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 461-60.N	LANDSCAPING AREA REQUIREMENT PARKING LOTS OVER 10,000 SF: 20 SF OF LANDSCAPING OF INTERIOR LOT FOR EACH PARKING SPACE (10 SPACES) * (20) = 200 SF REQUIRED MINIMUM INTERIOR SIZE: 5' x 5'	1,464 SF COMPLIES
§ 461-24.I	LANDSCAPING ON FILL AREA VEGETATION SHALL BE RE-ESTABLISHED ON ALL EXPOSED FILL AREAS. EXPOSED GRADED AREAS SHALL BE MULCHED AND SEEDED TO PROVIDE BASIC GROUND COVER	COMPLIES
§ 461-21.B.2	MINIMUM TREE SIZE 4" CALIPER AND 4.5 FT HT	COMPLIES

ERNST SEED CO. NATIVE STEEP SLOPE MIX SEEDING SPECIFICATIONS (ERNST MIX-181):

SORGHASTRUM NUTANS	INDIAN GRASS	31.1%
LOLIUM MULTIFLORUM	ANNUAL RYE GRASS	20%
ANDROPOGON GERARDII	BIG BLUE STEM 'NIAGARA'	14%
ELYMUS CANADENSIS	CANADA WILDRYE	7%
AGROSTIS PERENNANS	ALBANY PINE BUSH	4%
PANICUM VERGATUM	SWITCHGRASS	4%
PANICUM CLANDESTINUM	DEER TONGUE	3%
ECHINACEA PURPUREA	PURPLE CONEFLOWER	1.5%
CHAMAECRISTA FASCICULATA	PARTRIDGE PEA	1.3%
HELIOPSIS HELIANTHOIDES	OXEYE SUNFLOWER	1.2%
COREOPSIS LANCEOLATA	LANCELEAF COREOPSIS	1.0%
RUDBECKIA HIRTA	BLACKEYED SUSAN	1.0%
MONARDA FISTULOSA	WILD BERGAMOT	.30%
ASCLEPIAS SYRIACA	COMMON MILKWEED	.20%
SOLIDAGO RUGOSA	WRINKLELEAF GOLDENROD	.20%
ASTER LATERIFLORUS	CALICO ASTER	.10%
ASTER PILOSUS	HEATH ASTER	.10%

1. SOW ABOVE MIX AT A RATE OF 15 LBS./ACRE
2. SUPPLEMENT ABOVE MIX WITH ANNUAL RYE AT A RATE OF 10 LBS/ACRE.
3. NO MOWING SHALL TAKE PLACE.

ERNST SEED CO. RETENTION BASIN FLOOR SEEDING SPECIFICATIONS (ERNST MIX-126):

PANICUM CLANDESTINUM	DEERTONGUE	20%
PUCCINELLIA DISTANS	ALKALIGRASS	20%
ELYMUS VIRGINICUS	VIRGINIA WILDRYE	18%
AGROSTIS STOLONIFERA	CREEPING BENTGRASS	15%
POA PALUSTRIS	FOWL BLUEGRASS	15%
CAREX VULPINOIDEA	FOX SEDGE	10%
CAREX SCOPARIA	BLUNT BROOM SEDGE	1%
JUNCUS EFFUSUS	SOFT RUSH	1%

1. SOW ABOVE MIX AT A RATE OF 20-40 LBS./ACRE OR .5-1 LBS/1,000 SF
2. SUPPLEMENT ABOVE MIX WITH ANNUAL RYE AT A RATE OF 30 LBS/ACRE.
3. MOW ONCE PER YEAR IN EARLY SPRING

IRRIGATION NOTE:

IRRIGATION CONTRACTOR TO PROVIDE A DESIGN FOR AN IRRIGATION SYSTEM SEPARATING PLANTING BEDS FROM LAWN AREA. PRIOR TO CONSTRUCTION, DESIGN IS TO BE SUBMITTED TO THE PROJECT LANDSCAPE DESIGNER FOR REVIEW AND APPROVAL. WHERE POSSIBLE, DRIP IRRIGATION AND OTHER WATER CONSERVATION TECHNIQUES SUCH AS RAIN SENSORS SHALL BE IMPLEMENTED. CONTRACTOR TO VERIFY MAXIMUM ON SITE DYNAMIC WATER PRESSURE AVAILABLE MEASURED IN PSI. PRESSURE REDUCING DEVICES OR BOOSTER PUMPS SHALL BE PROVIDED TO MEET SYSTEM PRESSURE REQUIREMENTS. DESIGN TO SHOW ALL VALVES, PIPING, HEADS, BACKFLOW PREVENTION, METERS, CONTROLLERS, AND SLEEVES WITHIN HARDSCAPE AREAS.

TREE REMOVAL NOTES

1. THE APPLICANT SHALL PLACE A ONE-INCH-WIDE RED, YELLOW, OR BLUE RIBBON AROUND THE TRUNK OF EACH TREE TO BE REMOVED AR A HEIGHT OF 4.5 FT ABOVE GROUND SO THAT THE PROPOSED TREE REMOVAL MAY BE INSPECTED IN THE FIELD.
2. NO PERSON SHALL CUT DOWN OR REMOVE ANY TREE OF A CALIPER OF FOUR INCHES OR GREATER MEASURED AT A HEIGHT OF 4.5 FT ABOVE THE GROUND OR ENGAGE IN ANY SITE CLEARING WITHOUT A TREE REMOVAL PERMIT.

CITY OF CLIFTON LANDSCAPING NOTES

1. ANY DISCREPANCIES BETWEEN PLANS, NOTES, DETAILS AND EXISTING CONDITIONS SHALL BE IMMEDIATELY REPORTED TO THE LANDSCAPE ARCHITECT PRIOR TO RESUMING WORK. THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ALL REVISIONS DUE TO FAILURE TO GIVE SUCH NOTICE.
2. CONTRACTOR SHALL FIELD LOCATE PLANT MATERIAL FOR LANDSCAPE ARCHITECT APPROVAL PRIOR TO INSTALLATION.
3. CONTRACTOR SHALL NOT DEVIATE FROM THE APPROVED PLAN AND ITS CONTENTS WITHOUT THE PRIOR WRITTEN CONSENT BY THE LANDSCAPE ARCHITECT.
4. STIPULATION OF GUARANTEE PERIOD OF TWO (2) YEARS. UPON COMPLETION OF THE TWO-YEAR PLANT GUARANTEE PERIOD, THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR REMOVING PLANTING SAUCERS AND ALL STAKES FROM TREE. THIS SHALL NE DONE CONSULTATION WITH THE LANDSCAPE ARCHITECT.
5. ALL PLANT MATERIAL SHALL HAVE ROOT BALLS THAT ARE NOT CRACKED, LOOSE, OR BROKEN. PLANT MATERIALS THAT ARE STORED ON THE SITE FOR LONGER THAN THREE DAYS SHALL BE KEPT IN THE SHADE, PROTECTED FROM WEATHER AND MECHANICAL INJURY AND HAVE ROOT BALLS HEALED IN AND KEPT WATERED WELL.
6. ALL PLANT BEDS AND LAWN AREAS SHALL BE SERVICED BY AN AUTOMATIC IRRIGATION SYSTEM.
7. ALL TREES NOT SERVICED BY AUTOMATIC IRRIGATION SHALL BE PROVIDED WITH 20 GALLON TREE WATERING BAGS OR DIAPERS, AND SHALL BE FILLED/REFILLED AND MAINTAINED BY THE LANDSCAPE CONTRACTOR FOR THE DURATION OF THE GUARANTEE PERIOD.
8. ALL PLANT BEDS SHALL RECEIVE A MINIMUM OF EIGHTEEN (18) INCHES OF TOPSOIL (SETTLED) AND ALL LAWN AREAS SIX (6) INCHES OF TOPSOIL (SETTLED). ALL PARKING LOT PLANTING ISLANDS SHALL RECEIVE THIRTY-SIX (36) INCHES OF TOPSOIL.
9. TREES ON THE SITE SHALL BE REGULATED IN TERMS OF REMOVAL, REPLACEMENT AND PROTECTION IN ACCORDANCE WITH CITY ORDINANCE 433-30, AS NECESSARY.

LANDSCAPING NOTES

1. THE CONTRACTOR SHALL RESTORE ALL DISTURBED GRASS AND LANDSCAPED AREAS TO MATCH EXISTING CONDITIONS UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
2. THE CONTRACTOR SHALL RESTORE ALL DISTURBED LAWN AREAS WITH A MINIMUM 4 INCH LAYER OF TOPSOIL AND SEED.
3. THE CONTRACTOR SHALL RESTORE MULCH AREAS WITH A MINIMUM 3 INCH LAYER OF MULCH .
4. THE MAXIMUM SLOPE ALLOWABLE IN LANDSCAPE RESTORATION AREAS SHALL BE 3 FEET HORIZONTAL TO 1 FOOT VERTICAL (3:1 SLOPE) UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
5. THE CONTRACTOR IS REQUIRED TO LOCATE ALL SPRINKLER HEADS IN AREA OF LANDSCAPING DISTURBANCE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL RELOCATE SPRINKLER HEADS AND LINES IN ACCORDANCE WITH OWNER'S DIRECTION WITHIN AREAS OF DISTURBANCE.
6. THE CONTRACTOR SHALL ENSURE THAT ALL DISTURBED LANDSCAPED AREAS ARE GRADED TO MEET FLUSH AT THE ELEVATION OF WALKWAYS AND TOP OF CURB ELEVATIONS EXCEPT UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET. NO ABRUPT CHANGES IN GRADE ARE PERMITTED IN DISTURBED LANDSCAPING AREAS.

30' 0' 30' 60'

GRAPHIC SCALE IN FEET
1" = 30'

ISSUE	DATE	BY	DESCRIPTION
00	02/24/2023	SPM	FOR MUNICIPAL SUBMISSION

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PRELIMINARY AND FINAL MAJOR SITE PLAN

522 VALLEY ESTATES, LLC

PROPOSED TOWNHOUSE DEVELOPMENT

BLOCK 32.01, LOT 12
522 VALLEY ROAD (COUNTY ROUTE 621)
CITY OF CLIFTON
PASSAIC COUNTY, NEW JERSEY

AFTON M. SAVITZ, P.E.
NEW JERSEY LICENSE No. 57674
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 30' | PROJECT ID: RUT-220013

TITLE: LANDSCAPING PLAN

DRAWING: C-13

APPENDIX C
NRCS COUNTY SOIL SURVEY

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

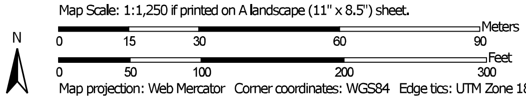
Custom Soil Resource Report for

Passaic County, New Jersey

November 30, 2022

Soil Map

Map Scale: 1:1,250 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BonDb	Boonton silt loam, 15 to 35 percent slopes, very stony	2.7	69.2%
HomC	Holyoke-Rock outcrop complex, 3 to 15 percent slopes	0.9	23.6%
USBOOC	Urban land-Boonton complex, red sandstone lowland, 8 to 15 percent slopes	0.3	7.2%
Totals for Area of Interest		**3.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Passaic County, New Jersey

BonDb—Boonton silt loam, 15 to 35 percent slopes, very stony

Map Unit Setting

National map unit symbol: 1kgy8
Elevation: 100 to 640 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Boonton, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton, Very Stony

Setting

Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Ap - 0 to 8 inches: silt loam
BA1 - 8 to 15 inches: fine sandy loam
BA2 - 15 to 23 inches: gravelly loam
Bt - 23 to 30 inches: gravelly fine sandy loam
Bx - 30 to 50 inches: gravelly sandy loam
Cx - 50 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 15 to 30 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 24 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Haledon, very stony

Percent of map unit: 10 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Holyoke, rocky

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Summit
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

HomC—Holyoke-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: b0py
Elevation: 50 to 870 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Holyoke and similar soils: 80 percent
Rock outcrop: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Holyoke

Setting

Landform: Ground moraines, hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: silt loam
Bw1 - 5 to 14 inches: silt loam
Bw2 - 14 to 18 inches: loam
R - 18 to 80 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: F145XY011CT - Well Drained Shallow Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear

Typical profile

R - 0 to 80 inches: bedrock

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Yalesville, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

USBOOC—Urban land-Boonton complex, red sandstone lowland, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1krjy
Elevation: 20 to 590 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, boonton red sandstone lowland substratum: 60 percent
Boonton, red sandstone lowland, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Boonton Red Sandstone Lowland Substratum

Setting

Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material
H2 - 12 to 67 inches: gravelly loam
2CB - 67 to 83 inches: gravelly sandy loam

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Boonton, Red Sandstone Lowland

Setting

Landform: Ground moraines
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy till derived from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: silt loam
BE - 3 to 10 inches: loam

Bw - 10 to 27 inches: gravelly loam
Bx1 - 27 to 40 inches: gravelly fine sandy loam
Bx2 - 40 to 67 inches: gravelly fine sandy loam
BCx - 67 to 83 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

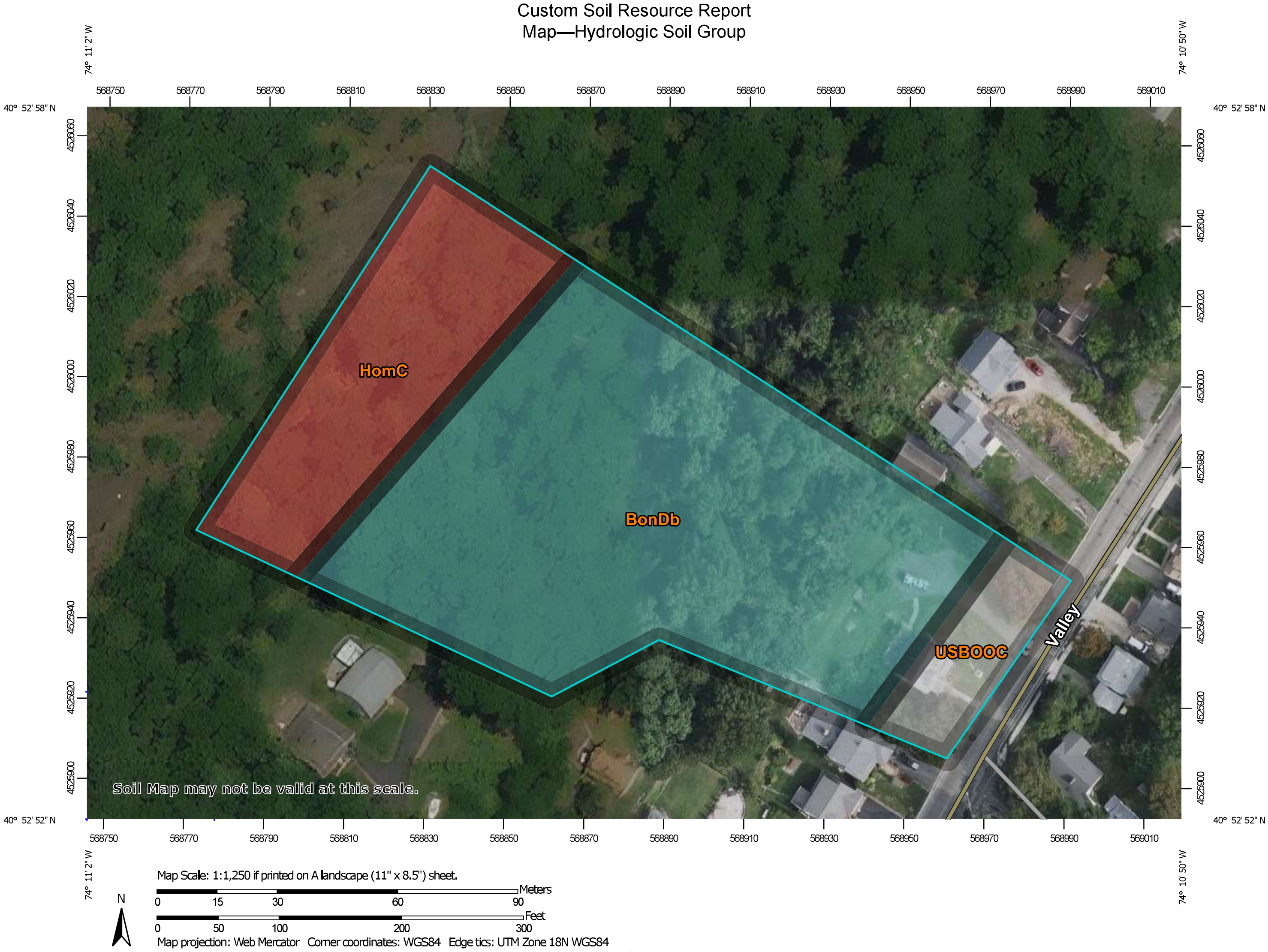
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Udorthents, boonton red sandstone lowland substratum

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Map—Hydrologic Soil Group



Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BonDb	Boonton silt loam, 15 to 35 percent slopes, very stony	C	2.7	69.2%
HomC	Holyoke-Rock outcrop complex, 3 to 15 percent slopes	D	0.9	23.6%
USBOOC	Urban land-Boonton complex, red sandstone lowland, 8 to 15 percent slopes		0.3	7.2%
Totals for Area of Interest			**3.9**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D
GEOTECHNICAL INVESTIGATION REPORTS

<u>INVENTORY</u>

REPORT OF LIMITED GEOTECHNICAL INVESTIGATION

REPORT OF STORMWATER MANAGEMENT AREA EVALUATION

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August 22, 2022

via email

522 VALLEY ESTATES, LLC
164 Getty Avenue
Clifton, New Jersey 07011

Attention: Ms. Gina Gufarotti
Associate

Regarding: REPORT OF LIMITED GEOTECHNICAL INVESTIGATION & SLOPE STABILITY ANALYSIS
PROPOSED RESIDENTIAL DEVELOPMENT
522 VALLEY ROAD
BLOCK 32.01, LOT 12
CLIFTON, PASSAIC COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GJ2219439.000

Dear Ms. Gufarotti:

Whitestone Associates, Inc. (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The purpose of the investigation was to evaluate the existing subsurface conditions and conduct a slope stability analysis in support of the proposed development referenced above. Whitestone's scope of services included conducting test borings across the subject site, evaluating the conditions encountered, and developing geotechnical recommendations for the proposed residential redevelopment and related earthwork.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The approximately 3.3-acre subject property located at 522 Valley Road (Block 32.01, Lot 12) in Clifton, Passaic County, New Jersey currently houses a single-family residential dwelling with associated pavements, landscaped areas, and utilities. Based on the October 14, 2021 *Civil Plan Set* prepared by Koestner Associates (Koestner), the subject site is characterized by steep easterly dipping slopes with grade changes on the order of approximately 240 feet. A natural cliff was observed within the northwestern portion of the site with an exposed height of approximately 120 feet.

1.2 Site Geology

The subject property is situated within a section of the Piedmont Physiographic Province known as the Newark Basin. Specifically, the subject site is underlain by the Lower Jurassic-age and Upper Triassic-age Conglomeratic Sandstone member of the Passaic Formation, which is part of the Brunswick Group, and the Lower Jurassic-age Orange Mountain Basalt.

The Conglomeratic Sandstone member generally consists of brownish-red pebble conglomerate with medium-grained to coarse-grained feldspathic sandstone and micaceous siltstone that is cross laminated, burrowed, and locally contains pebble layers. The Orange Mountain Basalt generally consists of dark greenish gray to greenish black basalt composed of mostly calcic plagioclase and clinopyroxene.

The overburden materials at the site include Rahway Till associated with the Wisconsinan Glacier that presumably reached its most southerly advance approximately 20,000 years ago and ended approximately 10,000 years ago. The glacial deposits are expected to overlay the weathered rock. Glacial till in the area typically contains a heterogeneous mixture of sand, silt, clay and gravel mixed with variable amounts of boulders and cobbles. Overburden materials also include man-made fill associated with past and present development of the subject site.

1.3 Proposed Construction

Based on the aforementioned *Civil Plan Set* and correspondence with 522 Valley Estates, LLC, the proposed redevelopment includes demolition of the existing site structure and construction of 21 townhomes with retaining walls, pavements, landscaped areas, and utilities. The proposed redevelopment is anticipated to have cuts and fills upward of 40 feet. Maximum column and wall loads are anticipated to be less than 75 kips and 3.0 kips per linear foot, respectively.

2.0 FIELD & LABORATORY WORK

2.1 Field Exploration

Field exploration at the project site was conducted by means of three soil test borings (identified as B-1 and B-3) and one offset boring (identified as B-1A) conducted with a truck-mounted drill rig and tripod-mounted drilling equipment using hollow stem augers and split-spoon sampling techniques. The subsurface tests were conducted within accessible portions of the subject site to depths ranging from 4.8 feet below ground surface (fbgs) to 35 fbgs. Test locations subsequently were backfilled to the surface with excavated soils from the investigation or grout, as necessary. The locations of the tests are shown on the accompanying *Boring Location Plan* included as Figure 1.

The subsurface tests were conducted in the presence of a Whitestone geologist who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the subsurface tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Laboratory Program

Representative samples of the various strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216) and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict the soil's behavior under construction and service loads. Laboratory test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring	**Sample**	**Depth (fbgs)**	**% Passing No. 200 Sieve**	**Moisture Content (%)**	**Liquid Limit (%)**	**Plastic Index (%)**	**USCS Classification**
B-1	S-3	5.0 - 7.0	34.6	14.0	21	3.0	SM
B-3	S-2/S-3	2.0 - 4.75	20.8	4.4	NP	NP	GM

Notes: NP = Non-Plastic

3.0 EXISTING CONDITIONS

3.1 Subsurface Conditions

The subsurface soil conditions encountered within the subsurface tests consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover: The subsurface tests were conducted within existing landscaped areas and encountered approximately two inches to three inches of topsoil at the surface.

Glacial Deposits: Underlying the surface cover, the subsurface tests encountered natural glacial deposits generally consisting of silty sand (USCS: SM), sandy silt (USCS: ML), and gravel with variable amounts of silt and sand (USCS: GM & GP-GM). The glacial deposits extended to a maximum depth of approximately 33 fbgs. SPT N-values within this stratum ranged from 13 blows per foot (bpf) to refusal (defined as greater than 50 blows per six-inch advancement of the split-spoon sampler), indicating a medium dense to very dense relative density and averaging greater than 50 bpf.

Weathered Rock/Bedrock: Top of weathered rock materials were encountered in the deeper soil borings (identified as B-1 and B-1A) at depths ranging between approximately 30 fbgs and 33 fbgs. SPT N-Values recorded within the weathered rock materials generally were within refusal range. Equipment refusal on apparent bedrock was encountered at approximate depths ranging between 33.1 fbgs and 35 fbgs.

Groundwater: Static groundwater was not encountered within the soil borings to a maximum explored depth of approximately 35 fbgs. However, perched/trapped water was encountered within the deeper borings conducted above weathered rock at depths ranging between approximately 30 fbgs and 33 fbgs. Perched/trapped water and groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

3.2 Existing Geology & Exposed Bedrock

As outlined in the *Civil Plan Set,* the northwestern portion of the subject site has approximately 9,000 square feet of exposed bedrock consisting of conglomerate sandstone. The results of Whitestone's visual observations indicated that the existing rock is generally in a massive condition with few indications of erosion or potential rockfall, however, maintenance of the existing exposed rock should be executed as detailed below.

Rockfall is the movement of rock along a steep slope where natural rock slope excavations exist. The rockfall process can be accelerated due to freeze-thaw and ongoing weathering of the exposed rock. As such, a rockfall catchment zone should be installed beneath the proposed rock walls at the subject site. For this site, a rockfall catchment area is defined as the area between the edge of pavement/walkway and the base of a cut slope, used to restrict rockfalls. The use of catchment areas to contain and restrict rockfall from the roadways and/or walkways is one of the best and most effective rockfall protective measures.

Should site constraints make the rockfall catchment zone unfeasible, alternate methods such as shotcrete, wire mesh, catch fences, or tied-back walls may be evaluated as a replacement. Whitestone should be contacted for further evaluation if it is determined that the rockfall catchment zone option is not possible.

4.0 GLOBAL STABILITY EVALUATION

4.1 General

The proposed redevelopment will include the construction of 21 townhomes with retaining walls, pavements, landscaped areas, and utilities. The proposed redevelopment is anticipated to have cuts and fills upward of 40 feet to the existing gabion wall. As such, a slope stability analysis was conducted to assess the conditions of the existing slope and evaluation global stability for areas of concern based on current and potential proposed conditions.

4.2 Method of Analysis

Whitestone evaluated the global stability for the existing slope and proposed conditions using classical limit equilibrium methods that assume full development of shear strength along the rupture surface at failure. The limit equilibrium method requires information about the soil strength characteristics to compute a factor of safety along a potential sliding mass. Information regarding stress strain behavior is not used and no information regarding slope movements are produced. Movements are usually analyzed by the finite element analysis, which is outside the scope of this study. The factor of safety is the ratio between the soil shear strength and the shear stress required to stabilize the slope. The computer program Geostase was used to conduct the slope stability analysis. The method of analysis selected for this evaluation included a random search of potential failure surfaces using the Modified Bishop Method.

4.3 Existing Soil Parameters

EXISTING SOIL PARAMETERS			
Soil Type	**Total Unit Weight (pcf)**	**Saturated Unit Weight (pcf)**	**Internal Friction Angle (degrees)**
Glacial Deposits	125	135	30
Weathered Rock	135	145	32
Bedrock	140	140	35

4.4 Summary of Findings

Based on the project information, Whitestone conducted a slope stability analysis across the subject site to determine the most critical failure paths along the existing slope. Based on Whitestone's analyses, the most critical profile for the proposed development exhibited a minimum factor of safety of 1.850 (factor of safety of 1.5 typically required for stability). Furthermore, the existing factor of safety for the subject site is 2.434. As such, contingent upon adequate design of the proposed retaining structures for the proposed redevelopment, the proposed improvements are not anticipated to negatively impact global stability for the proposed development. Detailed slope stability analyses are provided herein as Figures 2A and 2B.

5.0 CONCLUSIONS & RECOMMENDATIONS

The results of the investigation indicate that the proposed structures may be supported on conventional shallow foundations designed to bear within the underlying natural materials and/or controlled structural backfill. The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted such that the recommendations of this report can be reviewed.

5.1 Site Preparation & Earthwork

Surface Cover Stripping and Demolition: Prior to stripping operations, all utilities should be identified and secured. Any remaining vegetation, trees, topsoil, organic matter, portions of the existing building and pavements to be demolished and stripped should be removed from within the limits of areas requiring structural fill. Existing structural elements, such as foundation walls, or any concrete foundations, walls or slabs encountered during excavations, should be removed entirely from below proposed foundations and their zones of influence (as determined by lines extending at least one foot laterally beyond footing edges for each vertical foot of depth) and excavated to at least two feet below proposed construction subgrade levels elsewhere. Foundations and slabs may remain in place below these depths below proposed pavements and landscaped areas, where interference with future construction is avoided, however, any existing slab to remain should be thoroughly broken such that maximum particle size is 12 inches to allow vertical drainage of water. The demolition contractor should be required to conduct all earthwork in accordance with the recommendations in this report including backfilling any excavation, utility, etc. with structural fill. All fill or backfill placed in structural areas during any demolition operations should be placed as structural fill in accordance with the recommendations provided in this report.

Excavation Difficulties: Cobbles/boulders and apparent obstructions encountered at the site will present excavation difficulties for foundations, utilities, and similar excavations at variable depths below the surface. Excavation difficulties will be affected by the size of the excavation depth and equipment used. Heavy excavating equipment with ripping tools will probably be effective in removing cobbles/boulders and most obstructions during site grading. The speed and ease of excavation will depend on the type of grading equipment, the skill of the equipment operators, and the size of the excavation. Planned excavation depths beyond refusal depths and in confined excavations, such as for foundation embedment or utility trenches, may require ripping tools, extreme service buckets, or pneumatic hammers.

Surface Preparation/Proofrolling: Prior to placing any fill or subbase materials to raise or restore grades to the desired subgrade elevations, the existing exposed soils should be compacted to a firm surface with several passes in two perpendicular directions of a minimum 10-ton vibratory roller. The roller should be operated in the static mode or a kneading "sheepsfoot" roller should be used if silt and/or clay soils are encountered at subgrade elevations. The surface then should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets which may require removal and replacement or further investigation. Proofrolling should be conducted after a suitable period of dry weather to avoid degrading an otherwise stable subgrade. Any fill or backfill should be placed and compacted in accordance with Section 5.2.

Weather Performance Criteria: Because the site soils are, at least, moderately moisture sensitive and will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during warm, dry weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.2 of this report may be required prior to resuming work on disturbed subgrade soils. The site contractors should employ necessary means and methods to protect the subgrade including, but not limited to the following:

- leaving the existing pavement in place as long as practical to protect the subgrade from freeze-thaw cycles and exposure to inclement weather;
- sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- regrading the site as needed to maintain positive drainage away from construction areas;
- removing wet surficial soils and ruts immediately; and
- limiting exposure to construction traffic especially following inclement weather and subgrade thawing.

Subgrade Protection and Inspection: Every effort should be made to minimize disturbance of the on-site soils by construction traffic and surface runoff. The on-site soils may deteriorate when subjected to repeated construction traffic and may require removal and replacement. These materials also may require wetting and recompaction during dry periods or discing, drying and aeration during wet periods. The contractor should be responsible for protection of subgrades and minimization of exposure of the site soils to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. All rutting from construction equipment should be removed prior to any forecasted or actual precipitation. The services of the geotechnical engineer should be retained to inspect soils conditions immediately prior to concrete placement to verify the suitability of prepared foundation subgrades for support of design loads.

5.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 10 percent of material finer than a #200 sieve. Silts, clays, and silty or clayey sands and gravels with higher percentage of fines and with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner's approval, provided that the required moisture content and compaction controls are met. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Soil Reusability: Whitestone anticipates that the majority of the underlying natural site soils will be suitable for selective reuse as structural backfill materials provided that any deleterious materials, oversized, and/or objectionable debris encountered are segregated and moisture contents are controlled within two percent of the optimum moisture content. Reuse of the fine-grained natural soils will be contingent on careful inspection by the owner's geotechnical engineer during construction. Soils that become exceedingly wet will require extensive drying prior to reuse. The reuse of the granular soils with a high percentage of plastic fines typically is possible only during ideal weather conditions. Reuse of these soils may require mixing with a more granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas.

Alternatively, imported materials may be required to expedite earthwork operations, especially if the construction schedule or the site area restricts moisture control operations, such as spreading and air drying the soil.

Compaction and Placement Requirements: All fill and backfill should be placed in maximum nine-inch loose lifts and compacted to 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Whitestone recommends using a small hand-held vibratory compactor to compact the on-site soils within any footing excavations.

5.3 Groundwater Control

Static groundwater was not encountered within the borings to a maximum explored depth of approximately 35 fbgs. However, perched groundwater may be encountered following periods of wet weather within fine-grained portions of the natural site soils, especially following precipitation events. Therefore, temporary groundwater control measures should be implemented as described below. Whitestone anticipates that dewatering typically would include numerous sump pumps along the excavation perimeter.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to rainfall. Overexcavation of saturated soils and replacement with controlled structural fill and/or one foot to two feet of open graded gravel (such as ¾-inch clean crushed stone) may be required prior to resuming work on disturbed subgrade soils.

5.4 Shallow Foundation Design Criteria

Whitestone recommends that the proposed structures be supported on conventional shallow foundations designed to bear within the underlying natural soils and/or properly placed structural fill provided these materials are properly evaluated, placed, and compacted in accordance with this report. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 4,000 pounds per square foot. Alternatively, the proposed foundations may be designed to bear entirely in the underlying weathered rock/bedrock and be designed using a maximum allowable net bearing pressure of 6,000 pounds per square foot.

All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings (if planned).

Below-grade footings should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

Partial Weathered Rock/Bedrock Support: Foundations should not be supported partially on weathered rock, weathered rock-sized cobbles/boulders, or bedrock and partially on soil because of the risk of brittle fracture due to a hinging effect. If the proposed bearing elevations result with partial bearing on such materials, Whitestone recommends removing a minimum of six inches of the weathered rock/bedrock and restoring the bearing elevation with structural fill. As such, rock should be overexcavated for a transition length of 20 feet and backfilled with structural backfill per recommendations outlined in this report for any foundation that results in partial rock and partial soil conditions.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils along the footing bottoms be verified by a geotechnical engineer immediately prior to placing concrete for the footings. In the event that areas of unsuitable materials are encountered, additional overexcavation and replacement of the materials may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grades are restored with lean concrete. The bottom of overexcavations should be compacted with walk-behind compactors, vibrating plates, or plate tampers ("jumping jacks"), as appropriate, to compact locally disturbed materials.

Settlement: Whitestone estimates post construction settlements of proposed foundations to be less than one inch if the recommendations outlined in this report are properly implemented. Differential settlement of foundations should be less than one-half inch.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *2018 International Building Code - New Jersey Edition*, the subject site may be assigned a Site Class C. As such, liquefaction considerations are not expected to have a substantial impact on design.

Frost Coverage: Footings subject to frost action should be placed at least 36 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Because competent rock is not susceptible to frost heaving conditions, foundations bearing directly on top of competent rock, as verified during construction by the geotechnical engineer are not required to extend to typical frost protection depths.

5.5 Lateral Earth Pressures

General: Due to the significant grade changes across the property, the proposed redevelopment is anticipated to have retaining walls with cuts and fills upward of 40 feet. While the design of the retaining structures is beyond Whitestone's current scope of work, Whitestone would be pleased to assist with the calculation of lateral earth pressures based on the soil parameters presented herein during the structural design phase when final grading and wall geometries are available.

Lateral Earth Pressures: Temporary retaining structures and permanent below-grade walls may be required to resist lateral earth pressures. Proposed below-grade walls must be capable of withstanding active and at-rest earth pressures. Retaining/below-grade walls free to rotate generally can be designed to resist active earth pressures. Retaining/below-grade walls corners and restrained walls need to be