STONEFIELD

STORMWATER OPERATIONS & MAINTENANCE MANUAL

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

PREPARED FOR:

522 VALLEY ESTATES, LLC

PREPARED BY:

STONEFIELD ENGINEERING & DESIGN, LLC
FEBRUARY 24, 2023
RUT-220013

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REPORT CONTENTS

1.0 PROJECT DESCRIPTION

522 Valley Estates, LLC is proposing to redevelop Block 32.01, Lot 12, commonly known as 522 Valley Road (County Route 621) located along the southbound side of Valley Road approximately 50 feet from the intersection with Mount Washington Drive (herein referred to as the "project site") to accommodate three (3) three-story townhouse buildings totaling 20 individual townhouse units. Additional improvements one (1) two-car driveway per townhouse unit, an off-street parking lot for guest parking, lighting, landscaping, utility services, and stormwater management and conveyance systems.

The project site is 167,553 SF (3.85 acres), the extent of land disturbance is 107,441 SF (2.47 acres), and 44,584 SF (1.02 acres) of new impervious surfaces, will be created by the project. In addition, the project proposes the addition of 23,658 SF (0.54 acres) of new motor vehicle surface. The overall drainage area was modeled as 215,753 SF (4.95 acres). Project Figures can be found in Appendix A of this Report.

This Stormwater Operations & Maintenance Manual has been prepared to delineate operational and maintenance responsibilities for the stormwater best management practices (BMPs) proposed to meet the requirements set forth by the City of Clifton, County of Passaic, Hudson-Essex-Passaic Soil Conservation District, the New Jersey Administrative Code NJAC), and the New Jersey Department of Environmental Protection (NJDEP).

2.0 PROPOSED DEVELOPMENT

The proposed redevelopment will consist of three (3) three-story townhouse buildings with a total of 20 individual townhouse units. Additional improvements include one (1) two-car driveway per townhouse unit, an off-street parking lot for guest parking, lighting, landscaping, utility services, stormwater management and conveyance systems. The site will be accessed via one full-movement driveway. The proposed improvements and associated stormwater facilities shall result in an overall reduction of runoff from the site at each point of interest. This shall be achieved by the implementation of two (2) bioretention basins, twenty (20) permeable pavement systems and one (1) grass swale.

3.0 STORMWATER MANAGEMENT OPERATIONAL PROCEDURES

Operation and maintenance of the permanent stormwater control BMPs shall be the responsibility of the operator of the project site at the time that the applicable maintenance is required. The current owner and responsible agent of the project is:

522 Valley Estates, LLC
522 Valley Road
Clifton, NJ 07011
CONTACT:
Phone: (973) 846-0300

A copy of this report shall be kept on-site at all times both during and after construction. Upon reviewing agency approval, the title and date of the maintenance plan as well as the contact information of the current agent responsible for maintaining the stormwater management measures for the project shall be recorded on the deed of the property on which the measures are located. Any future change in this information such as change in property ownership shall also be recorded on the deed.

The current responsible agent shall evaluate the maintenance plan for effectiveness at least annually and revise the plan as necessary. A detailed, written log of all preventative and corrective maintenance performed for each stormwater management measure must be kept, including a record of all inspections and copies of maintenance-related work orders. Upon request from a public entity with jurisdiction over the project area the responsible agent shall make available the maintenance plan and associate logs and other records for review.

3.1 MAINTENANCE EQUIPMENT AND PERSONNEL

The current responsible agent shall ensure that adequate equipment and training is provided to maintenance personnel to perform the required maintenance tasks. Confined Space Entry Certification shall be required by personnel entering underground structures and pipes. The material and equipment necessary for inspection and maintenance activities shall include, but not be limited to, the following:

- *Bioretention Area Equipment:* Instruments to perform visual inspection of vegetative health, equipment to pump stormwater from the basin in the event of maintenance, vacuum truck and hose for removal of sediment from basin bottom, and necessary safety equipment.

- *Pervious Paving Area Equipment:* Material and equipment customary in pavement maintenance practices.

- *Grass Swales:* Instruments to perform visual inspection of vegetative health, equipment to pump stormwater from the basin in the event of maintenance, vacuum truck and hose for removal of sediment from basin bottom, and necessary safety equipment.

- *Landscape Areas:* Material and equipment customary in landscape maintenance practices.

- *Street Sweeping:* Litter vacuum or leaf/litter blower to collect sediment from asphalt surface, brooms, and disposal bags.

The estimated cost of routine, scheduled maintenance activities is estimated to be approximately $32,500.00 per year. Approximate breakdown of yearly routine maintenance costs is noted below (excludes structural repairs):

MAINTENANCE COST BREAKDOWN

Basin Inspection and Maintenance	$9,000 per year
Landscape Areas	$8,000 per year
Pervious Paver Systems	$10,000 per year
Sediment Debris and Trash Removal	$3,000 per year
Street Sweeping	$2,500 per year

3.2 MAINTENANCE ACCESS POINTS

Access to the bioretention basins, pervious paver systems and grass swale in is provided via the access driveway traveling through the center of the site as indicated on Sheet C-5 of the Site Plans, prepared by Stonefield Engineering & Design, LLC. Reduced sheets (not to scale) can be found in the Appendix of this Manual.

4.0 STORMWATER BMP INVENTORY

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in the Appendix of the Maintenance Plan.

4.1 BIORETENTION AREAS

Two (2) stormwater bioretention facilities are proposed for the project.

- *Bioretention Area A*: Bioretention Area A is located in the center of the proposed development area, to the south of proposed Townhome Unit B1. The basin manages runoff from the northern half of the

proposed development area including the drive aisles, sidewalk, and landscaped areas. The basin is equipped with an outlet control structure to manage various storms, and an emergency spillway, which directs runoff toward Bioretention Area B, in the case of overflow.

- *Design Purposes*:
    1. *Water Quantity*
        - *1.25 inches in 2 hours*
    2. Water Quantity
        - 2-year storm (3.47")
        - 10-year storm (5.23")
        - 100-yr storm (8.62")
- *Dimensions: 1,072 SF (Surface Area) x 4.5 FT (Depth)*
- State Plane Coordinates: Easting (X) – 580,083, Northing (Y) – 746,371

- *Bioretention Area B*: Bioretention Area B is located at the south end of the site adjacent to Valley Drive. The basin manages runoff from the southern half of the proposed development area including the entrance drive and landscaped areas. The basin is equipped with an outlet control structure to manage various storm events, and an emergency spillway, which directs runoff to Valley Drive, in the case of overflow.
    - *Design Purposes*:
        1. *Water Quantity*
            - *1.25 inches in 2 hours*
        2. Water Quantity
            - 2-year storm (2.47")
            - 10-year storm (5.23")
            - 100-yr storm (8.62")
    - *Dimensions: 1,331 SF (Surface Area) x 4.5 FT (Depth)*
    - State Plane Coordinates: Easting (X) – 580,200, Northing (Y) – 746,249

A typical bioretention area provides a higher level of water quality filtering than that of an infiltration basin.

4.2 PERVIOUS PAVING SYSTEMS

Twenty (20) pervious paving systems are proposed for the project:

- *Pervious Paving System:* Each of the twenty (20) proposed townhome units contains a pervious pavement system within its respective driveway. The permeable pavement systems manage the roof runoff from the townhome unit the driveway is associated with as well as the driveway itself.
    - *Design Purposes:*
        1. *Water quantity*
            - *1.25 inches in 2 hours*
        2. Water Quantity
            - 2-year storm (3.47")
            - 10-year storm (5.23")
            - 100-yr storm (8.62")
    - *Dimensions: See Table 1 below for permeable pavement dimensions and characteristics. Permeable pavement naming convention corresponds to which townhome unit the system is located in. (For example, PV-A1 is located in the driveway of townhome unit A-1.)*

TABLE 1: **PERMEABLE PAVEMENT SYSTEM SUMMARY**

Permeable Pavement System	Permeable Pavement Surface Area	System Stone Depth	Permeable Pavement Slope (%)
PV-A1	435 SF	1.25 FT	4.90%
PV-A2	424 SF	1.50 FT	4.90%
PV-A3	305 SF	2.00 FT	4.90%
PV-A4	350 SF	1.50 FT	4.90%
PV-A5	345 SF	1.50 FT	4.90%
PV-A6	350 SF	1.50 FT	4.90%
PV-A7	345 SF	1.50 FT	4.90%
PV-B1	350 SF	1.50 FT	4.90%
PV-B1	345 SF	1.50 FT	4.90%
PV-B3	322 SF	1.50 FT	4.90%
PV-B4	367 SF	1.50 FT	4.90%
PV-B5	333 SF	1.50 FT	4.90%
PV-B6	333 SF	1.50 FT	4.90%
PV-B7	343 SF	1.50 FT	4.90%
PV-C1	343 SF	1.50 FT	4.90%
PV-C2	334 SF	1.50 FT	4.90%
PV-C3	435 SF	1.50 FT	4.90%
PV-C4	424 SF	1.50 FT	4.90%
PV-C5	305 SF	1.50 FT	4.90%
PV-C6	350 SF	1.50 FT	4.90%

4.3 GRASS SWALE(S)

One (1) grass swale is proposed for the project:

- *Grass Swale:* The grass swale is located on the northern edge of the development extents. The swale collects and conveys offsite bypass and runoff from the undeveloped portion of the property to north. Runoff in the swale is conveyed to a proposed inlet which flows to the ultimate discharge point in Valley Road.
    - *Design Purposes:*
        1. General Conveyance across the site.

- *Dimensions: 23.0 FT (Length) x 310.0 FT (Width) x 1.0 (Depth)*
- *Slope:* 3.0% - 13.3%
- State Plane Coordinates: Easting (X) – 579,907, Northing (Y) – 746,339

4.4 OTHER MAINTENANCE

In addition to the scheduled inspections for the above referenced stormwater BMPs, the following general maintenance tasks shall be performed:

1. All stormwater inlets and manholes shall be inspected for debris and sediment accumulation and structural integrity at least four (4) times annually. Debris and sediment removal shall be scheduled as required to maintain stormwater runoff conveyance efficiency and disposed of in compliance with all applicable local, state, and federal waste regulations.

2. Street sweeping shall occur at least once (1) monthly in all parking lot areas onsite. Regenerative air equipment shall be used.

3. Trash receptacles onsite shall be emptied, and their liners replaced at a minimum of three (3) times per week.

4. Landscaping within the developed portions of the site shall be trimmed/mowed twice (2) monthly during the growing season. Reforested portions of the site shall be left undisturbed to vegetate naturally.

5.0 STORMWATER BMP PREVENTATIVE MAINTENANCE ACTIONS

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings

As per NJDEP BMP Manual Ch. 8 Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

5.1 ABOVE GROUND BIORETENTION AREA

The drainage areas for the drive aisles and sidewalk are not expected to be areas of high pollutant concentrations, proper maintenance must be performed to ensure adequate filtering is provided to the runoff of the drawing to this area. The following maintenance tasks shall be performed for the bioretention area.

5.3.1 WEEKLY

a) Watering – Immediately after installation, water daily for 14 days unless there is significant rainfall. This is crucial, particularly during dry periods during the first growing season. Plants typically require about an inch of water per week during the first growing season, you will only have to water during severe dry periods. Newly planted small plants are most vulnerable to stress. Be cautious that they do not get too dry or too wet.

b) Weeding – The maintenance contractor must have the ability to identify the rain garden planted species and potential weed species in order to avoid accidental removals due to mistaken identity. This is crucial to the rain gardens success. During the first few years, you will, more than likely, need to weed often during the growing season. You will need to weed less and less as the plants grow and surpass the weeds, so that by the third year you should only be weeding several times a year. Watch out for the most aggressive, invasive weed species.

5.3.2 QUARTERLY

All bioretention components which receive, or discharge stormwater must be checked for trapped debris and sediment accumulation at least four (4) times annually as well as after storm events exceeding one (1) inch of precipitation. These components include: the outlet structure, the bioretention bottom, curb cuts, rip rap aprons, flared end sections, and trash racks. Sediment removal shall take place when the bioretention area is completely dry. Disposal of debris and sediment shall be done in compliance with all applicable local, state, and federal waste regulations.

5.3.3 ANNUALLY

a) Mulching – Add mulch every spring to maintain a three-inch mulch layer on your rain garden. The mulch should prohibit most, if not all, weed growth. Any weeds that do succeed in growing should be easy to remove because they will have shallow roots. In addition to limiting weed seed germination, mulching also prevents the loss of soil through erosion. Remember that triple shredded hardwood mulch with no dye is preferred for rain gardens.

b) Pruning – Each spring, prune dead vegetation, deadhead flowers, and cut back tattered or unwieldy plants. This will encourage dense, new growth and improve the rain garden's filtering capacity. Remember that stems and seed heads can be left on the plants for winter interest, wildlife cover, and food for birds.

c) Soil Testing – Since you determined the nutrient and pH levels of your soil before planting the rain garden, remover to retest the soil every three to five years. Follow the recommendations to maintain the soil pH in an acidic range. If pH is less than 5.2, apply limestone; if greater than 7.0, add iron sulfate and sulfur to reduce pH. Add these amendments when no storms are expected to prevent runoff. Be sure to follow instructions or contact the local county extension office for guidance to prevent runoff of applied materials.

d) Replanting – Remove or replace plant material that is not thriving. Consider planting more of a particularly successful species.

e) Sediment Removal – The rain garden may accumulate sediment, particularly if it collects runoff from a driveway or a road. This is a sign of success; however, occasionally use a flat shovel to remove any excess sediment, leaves, or debris. Be cautious particularly of any buildup occurring near the water inlet of the rain garden, especially if your rain garden is located next to a driveway or road and you notice sand in the buildup. A grass buffer, near the rain garden's inlet and between the rain garden and the road, will prevent road sand, salt, and sediment from entering your rain garden. A small rock bed at the inlet will function similarly. The debris in the water will drop out along the grass strip or rock bed, making it easier to clean your rain garden.

f) Fertilizing – Fertilizing is NOT a part of maintaining your rain garden! The garden sustains itself with the help of organic material in the topsoil.

g) Additional Steps – Additional maintenance includes seed collection and taking cuttings from successful plants, planting more of a particularly successful species, re-seeding the berm if necessary, replacing rocks that may be diverting flow out of the garden, and building up areas where more protection is needed to prevent erosion. After installation, if the rain garden is not infiltrating at the desired rate, make holes using an augur in the rain garden and fill these holes with coarse sand.

h) Signage – Post a "No Mow" sign and be sure to consult with maintenance staff so they are mindful of the project.

5.3.4 BASIN DRAWDOWN

The following table outlines the design drawdown time (time elapsed for basin to completely drain after the end of a storm event) for the bioretention areas

Storm Event	*Precipitation (in)*	*Basin-A Drawdown (hr)*	*Basin-B Drawdown (hr)*
2 Year	3.47"	48.50 HR	32.10 HR
10 Year	5.23"	48.70 HR	32.70 HR
100 Year	8.62"	48.90 HR	33.00 HR

This table shall be referenced to the actual drawdown times for the detention basin to evaluate performance. Should significant increases in drawdown time be noted or if stormwater runoff remains in the basin more than 72 hours after the end of a storm event, the basin's outlet structures, pipe storage and tailwater levels must be evaluated to determine appropriate measures to be taken to ensure proper basin functionality.

5.6 PERVIOUS PAVING SYSTEMS

Pervious pavement inspections shall be performed by entering the basin area via the associated manhole along each of the basin perimeters. The following maintenance tasks shall be performed for the infiltration basins.

5.6.1 QUARTERLY

All detention basin components which receive, or discharge stormwater must be checked for trapped debris and sediment accumulation at least four (4) times annually as well as after storm events exceeding one (1) inch of precipitation. Disposal of debris and sediment shall be done in compliance with all applicable local, state, and federal waste regulations.

5.6.2 ANNUALLY

All structural components shall be checked at least once (1) annually for cracking, subsidence, spalling, erosion and deterioration.

5.6.3 BASIN DRAWDOWN

The following table outlines the design drawdown time (time elapsed for basin to completely drain after the end of a storm event) for pervious pavers.

Permeable Pavement System	*Precipitation (in) (100yr storm)*	*Drawdown (hr)*
PV-A1	8.62"	27.10 HR
PV-A2	8.62"	27.50 HR
PV-A3	8.62"	28.90 HR
PV-A4	8.62"	28.40 HR
PV-A5	8.62"	28.60 HR
PV-A6	8.62"	28.00 HR
PV-A7	8.62"	27.40 HR
PV-B1	8.62"	30.30 HR
PV-B2	8.62"	30.20 HR
PV-B3	8.62"	29.50 HR
PV-B4	8.62"	29.00 HR
PV-B5	8.62"	29.50 HR
PV-B6	8.62"	29.00 HR
PV-B7	8.62"	29.40 HR
PV-C1	8.62"	28.70 HR
PV-C2	8.62"	28.70 HR
PV-C3	8.62"	29.20 HR
PV-C4	8.62"	29.50 HR
PV-C5	8.62"	29.70 HR
PV-C6	8.62"	29.50 HR

This table shall be referenced to the actual drawdown times for the detention basin to evaluate performance. Should significant increase in drawdown time be noted or if stormwater runoff remains in the basin more than 72 hours after the end of a storm event, the basin's outlet structures, pipe storage and tailwater levels must be evaluated to determine appropriate measures to be taken to ensure proper basin functionality.

5.9 GRASS SWALES

Grass swale shall be accessed via the proposed stairs to the north of townhome unit B7. The following maintenance tasks shall be performed for grass swale.

5.9.1 QUARTERLY

All grass swale components which receive, or discharge stormwater must be checked for trapped debris and sediment accumulation at least four (4) times annually as well as after storm events exceeding one (1) inch of precipitation. These basin components include the proposed E inlet downstream of the swale, and flowline of the swale. Disposal of debris and sediment shall be done in compliance with all applicable local, state, and federal waste regulations.

5.9.2 ANNUALLY

All structural components including swale walls and the proposed inlet shall be checked at least once (1) annually for cracking, subsidence, spalling, erosion and deterioration.

5.10 GENERAL MAINTENANCE

In addition to the scheduled inspections for the above referenced stormwater BMPs, a periodic inspection by the Township will be performed. The following additional general maintenance tasks shall be performed.

5.10.1 MONTHLY

a. Street sweeping shall occur at least once (1) monthly in all parking lot areas onsite. Regenerative air equipment shall be used.

b. Trash receptacles onsite shall be emptied and their liners replaced at a minimum of three (3) times per week.

c. Landscaping within the developed portions of the site shall be trimmed/mowed twice (2) monthly during the growing season. Reforested portions of the site shall be left undisturbed to vegetate naturally.

5.10.2 QUARTERLY

a. All stormwater inlets and manholes shall be inspected for debris and sediment accumulation and structural integrity at least four (4) times annually. Debris and sediment removal shall be scheduled as required to maintain stormwater runoff conveyance efficiency and disposed of in compliance with all applicable local, state, and federal waste regulations.

5.10.3 ANNUALLY

a. A submission to the Township from the owner of the end-of-year maintenance records will be required.

6.0 STORMWATER BMP CORRECTIVE MAINTENANCE ACTIONS

Depending on many factors, such as the performance of preventative maintenance actions, weather, or unexpected incidents. Corrective requirements may not be precisely anticipated; however, a list of potential corrective maintenance actions may assist the responsible party in planning and estimating costs in advance.

Potential Corrective Maintenance Actions	***Stormwater Management Measures/No.***
▪ Repair/replacement of eroded or damaged riprap apron ▪ Repair/replacement of missing or damaged trash racks ▪ Repair/replacement of outlet pipes or orifices ▪ Revegetation of eroded side slope, aquatic bench, marsh, basin bottom, etc.	Bioretention Area A Bioretention Area B
▪ Repair/ Replacement of missing or damaged trash racks ▪ Repair/ Replacement of outlet pipes or orifices ▪ Revegetation of grass swales, etc.	Pervious pavement Systems PV-A1 – PV-A7, PV-B1 – PV-B7 & PV-C1 – PV-C6
▪ Revegetation of eroded side, side slope, basin bottom, grass swales, etc.	Grass Swale

The corrective maintenance actions should also be listed in the Field Manuals for the specific stormwater management measures on the site.

7.0 INSPECTION AND LOGS OF ALL PREVENTATIVE AND CORRECTIVE MEASURES

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site. Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Appendix C-1: General Inspection Checklist Log
- Appendix C-2: General Preventative Maintenance Log
- Appendix C-3: General Corrective Maintenance Log
- Appendix C-4: Bioretention Field Manual
- Appendix C-5: Pervious Pavement Field Manual
- Appendix C-6: Grass Swale Field Manual
- Appendix C-7: Annual Evaluation Records

All inspection and maintenance activities shall be recorded to document frequency of inspection and maintenance, and implementation of corrective action. All regularly scheduled inspections, inspections following one (1) inch of precipitation, maintenance activities, and repairs shall be recorded. Refer to the Appendix of this Manual for the BMP Inspection & Maintenance Log for this facility. This log shall be considered a minimum standard for recording purposes, the Operator and Inspection/Maintenance Personnel are encouraged to supplement the Log with additional notes and photos.

8.0 ANNUAL EVALUATION OF THE EFFECTIVENESS OF THE PLAN

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

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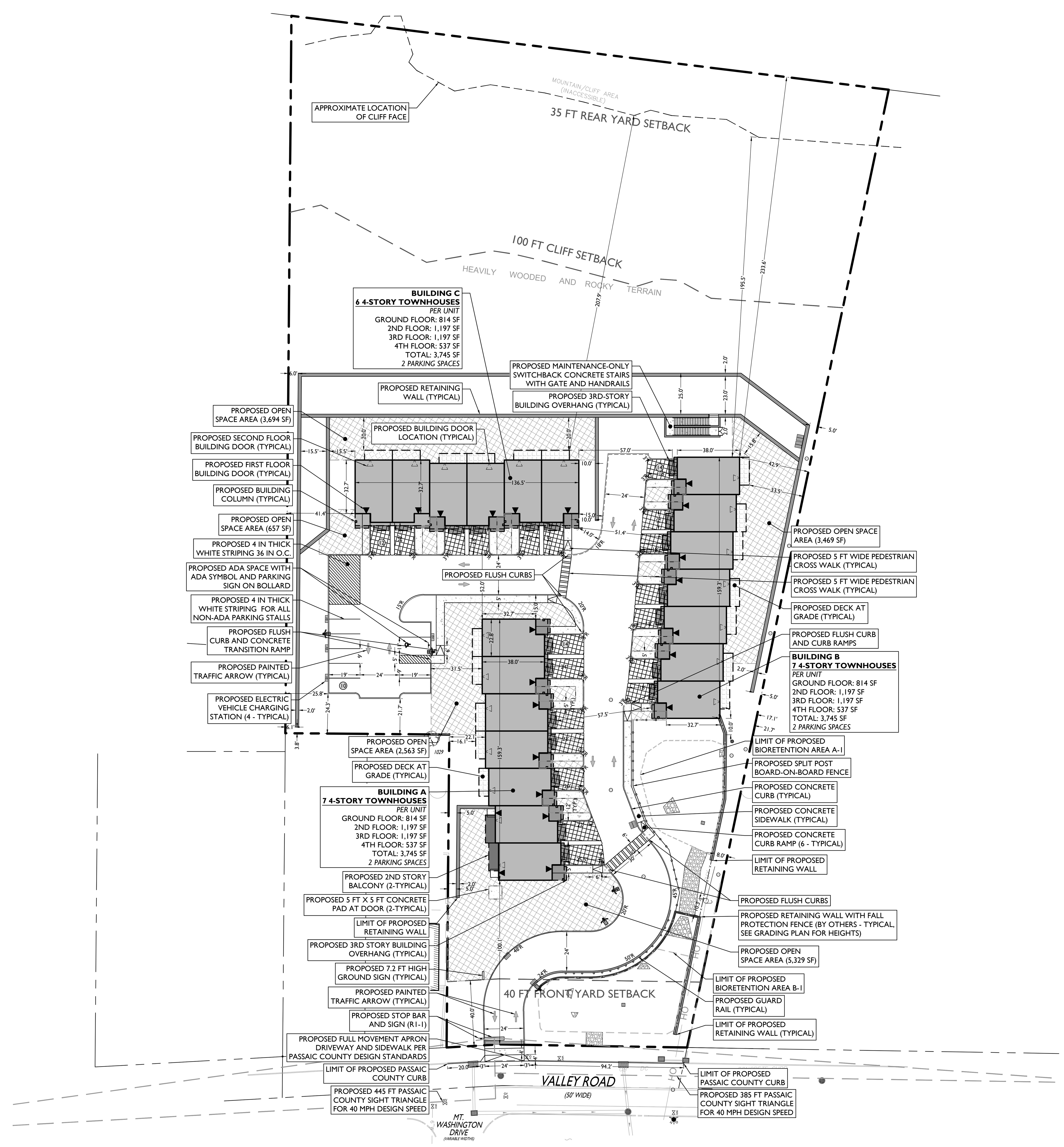
APPENDIX A:
PROJECT PLANS
(NOT TO SCALE)

APPENDIX A-1:
SITE PLAN



LAND USE AND ZONING

BLOCK 32.01, LOT 12

RESIDENTIAL ONE-FAMILY DWELLING (R-A1)

STEEP SLOPE OVERLAY DISTRICT

PROPOSED USE

TOWNHOUSES — PERMITTED USE

ZONING REQUIREMENT	REQUIRED	EXISTING	PROPOSED
MINIMUM LOT AREA	162,855 SF (3.5 AC)	167,553 SF (3.85 AC)	167,553 SF (3.85 AC)
MAXIMUM DENSITY	7 UNITS PER ACRE	N/A	5.19 UNITS PER ACRE
MINIMUM LOT DEPTH	100 FT	423.3 FT	423.3 FT
MAXIMUM BUILDING HEIGHT (*)	35 FT / 3 STORIES	1.5 STORIES	44.99 FT / 4 STORIES (V)
MINIMUM SETBACK (VALLEY ROAD)	40 FT	24.9 FT (EN)	100.1 FT
MINIMUM SETBACK (CLIFF FACE)	100 FT**	34.6 FT	195.5 FT*
MAXIMUM GRADE (PAVED ROAD)	14.0% / 10.0% AVG	N/A	13.5% / 7.3%
MAXIMUM GRADE (WALKWAY)	6.0%	N/A	4.9%

(V) VARIANCE
(EN) EXISTING NON-CONFORMITY
(*) BUILDING HEIGHT SHALL BE CALCULATED AS THE VERTICAL DISTANCE IN THE CASE OF GABLE ROOFS AND HIP ROOFS TO THE MEAN LEVEL BETWEEN THE EAVES AND THE HIGHEST POINT OF THE ROOF, AND IN ALL OTHER CASES TO THE LEVEL OF THE HIGHEST POINT OF THE ROOF, MEASURED AVERAGE GROUND LEVEL AT THE SIDES OF THE BUILDINGS IN ALL OTHER CASES. REFER TO AVERAGE GRADING PLAN (SHEET C-7).
(**) PER SECTION 461-24.1.3.A THE MINIMUM SETBACK FROM CLIFF FACE SHALL BE 50 FT PLUS THE HORIZONTAL DISTANCE OF THE TALUS SLOPE. 50 FT + 50 FT = 100 FT.

TOWNHOUSE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 461-21.B.1	MINIMUM NUMBER OF TOWNHOUSES PER ROW: 4 TOWNHOUSES	6 TOWNHOUSES
§ 461-21.B.1	MAXIMUM NUMBER OF TOWNHOUSES PER ROW: 8 TOWNHOUSES	7 TOWNHOUSES
§ 461-21.B.2	MINIMUM SPACING BETWEEN BUILDINGS: EQUAL TO MAXIMUM HEIGHT OF BUILDING: 42.0 FT	51.4 FT
§ 461-21.B.3	MINIMUM SETBACK FOR CONJOINED BUILDINGS: 2 FT PER EVERY TWO BUILDINGS	2.0 FT
§ 461-21.B.4	MAXIMUM LENGTH OF CONJOINED TOWNHOUSES: 160 FT	159.3 FT
§ 461-21.B.5	MINIMUM WIDTH OF TOWNHOUSE: 20 FT	22.8 FT
§ 461-21.B.6	OPEN SPACE REQUIREMENT: FRONT YARD SHALL BE DEDICATED TO OPEN SPACE. NO PARKING IS PERMITTED.	COMPLIES
§ 461-21.B.14	MAXIMUM COVERAGE REQUIREMENTS: PRINCIPAL BUILDINGS: 25% ACCESSORY BUILDINGS: 10% PARKING AND DRIVE AISLES: 30%	14.3% (23,940 SF) 0.0% (0 SF) 13.3% (22,314 SF)
§ 461-21.B.20	MINIMUM RECREATION AREA: 800 SF PER TOWNHOUSE (*) 20 TOWNHOUSES X 800 SF = 16,000 SF	17,316 SF (V)
§ 461-21.B.22	MAXIMUM NUMBER OF TOWNHOUSES PER ACRE: 13 TOWNHOUSES PER ACRE 13 TOWNHOUSES X 3.85 ACRES: 50 TOWNHOUSES	4.7 PER ACRE 20 TOTAL

(V) VARIANCE
(*) PER SECTION 461-21.B.2 OPEN SPACE SHALL CONSIST OF NOT LESS THAN 25 FT IN ANY DIRECTION. SHALL NOT BE LOCATED WITHIN 10 FT OF SIDE OR REAR PROPERTY LINES.

OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ RSIS 5:21-4.14	GARAGE PARKING REQUIREMENT: A ONE CAR GARAGE AND DRIVEWAY SHALL COUNT AS 2 OFF STREET PARKING SPACES PROVIDED THAT THE DRIVEWAY IS MINIMUM 18 FT	2 SPACES PER UNIT COMPLIES
§ 461-21.B.10	PARKING LOCATION REQUIREMENT: NO PARKING SHALL BE PERMITTED IN THE FRONT YARD OR WITHIN 10 FT OF ANY LOT LINE	21.7 FT
§ 461-21.B.13	DRIVE AISLE PARKING: NO PARKING SHALL BE PERMITTED ON INTERIOR STREETS OR ACCESS DRIVES	COMPLIES
§ 461-15.B.1.B	MAXIMUM DRIVE AISLE AND CURB CUT: DRIVE AISLE: 24 FT CURB CUT: 30 FT	24 FT 30 FT
§ 461-60.P	MINIMUM PARKING AREA DIMENSIONS: PERPENDICULAR PARKING: 19 FT X 9 FT	19 X 9 FT
§ 461-21.B.10	REQUIRED PARKING FOR TOWNHOUSES: TOWNHOUSES: 2 SPACES PER UNIT GUEST PARKING: 0.5 SPACES PER UNIT 2 SPACES X 20 TOWNHOUSES: 40 SPACES 1 SPACE X 20 TOWNHOUSES X 0.5: 10 SPACES **TOTAL REQUIRED: 40 + 10 = 50 SPACES**	40 SPACES 10 SPACES TOTAL: 50 SPACES
RSIS (NJAC 5.21-4.14)	PARKING REQUIREMENT (TOWNHOUSES) 3-BEDROOM TOWNHOUSE: 2.4 SPACES PER UNIT 2.4 SPACES X 20 UNITS: 48 SPACES	50 SPACES
BILL S3223	MINIMUM REQUIRED MAKE-READY ELECTRIC VEHICLE SPACES: 15% OF REQUIRED OFF STREET PARKING (0.15 X 50 SPACES): 7.5 SPACES = 8 EV SPACES MINIMUM REQUIRED ACCESSIBLE MAKE-READY ELECTRIC VEHICLE SPACES: 5% OF TOTAL MAKE-READY SPACES (8 MAKE-READY SPACES X 0.05) = 1 ACCESSIBLE SPACE MAXIMUM MAKE-READY ELECTRIC SPACE PARKING REDUCTION: (50 PARKING SPACES X 0.1) = 5 SPACES*	8 SPACES 1 ACCESSIBLE SPACE 5 SPACES

(*) 1 MAKE-READY SPACE SHALL COUNT NO LESS THAN 2 PARKING SPACES FOR PURPOSES OF COMPLYING WITH A MINIMUM PARKING SPACE REQUIREMENT PROVIDED IT DOES NOT REDUCE MORE THAN 10% OF OTHERWISE REQUIRED PARKING SPACES.

SIGNAGE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 461-54.	R DISTRICT PERMITTED SIGNS: NAMEPLATE, BULLETIN BOARD DIRECTORY, FOR-SALE OR FOR-RENT SIGN	GROUND SIGN (V)
§ 461-55.B.	GROUND SIGN REQUIREMENTS: BUILDING SETBACK LINES MUST BE OBSERVED MAXIMUM HEIGHT - 20 FT ABOVE GRADE OF VALLEY ROAD PROPOSED GRADE AT GROUND SIGN - 320.5' VALLEY ROAD FRONTAGE AVERAGE GRADE - 316.9' SIGN HEIGHT - 4.2 FT	40 FT 7.2 FT

(V) VARIANCE

SYMBOL	DESCRIPTION
	PROPERTY LINE
	SETBACK LINE
	SAWCUT LINE
	PROPOSED CURB
	PROPOSED DEPRESSED CURB
	PROPOSED FLUSH CURB
	PROPOSED EXTENDED CURB
	PROPOSED SIGNS / BOLLARDS
	PROPOSED BUILDING DOORS
	PROPOSED BUILDING
	PROPOSED BUILDING OVERHANG
	PROPOSED BALCONY
	PROPOSED PATIO
	PROPOSED CONCRETE
	PROPOSED OPEN SPACE
	PROPOSED RETAINING WALL

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND IT'S SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

CITY OF CLIFTON NOTES

1. THE APPLICANT PROJECT FRONTS THE VALLEY ROAD RIGHT-OF-WAY (COUNTY ROUTE 621), WHICH SHALL BE TO THE SATISFACTION OF THE PASSAIC COUNTY REPRESENTATIVES, IN ADDITION TO THE BOARD ENGINEER AND CITY REPRESENTATIVES.
2. THE APPLICANT SHALL BE RESPONSIBLE FOR THE EXPENSES RELATED TO ANY RECONSTRUCTION OF PAVEMENT, CURB, SIDEWALK, OR OTHER PUBLIC PROPERTY DAMAGED DURING CONSTRUCTION ACTIVITIES.

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
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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

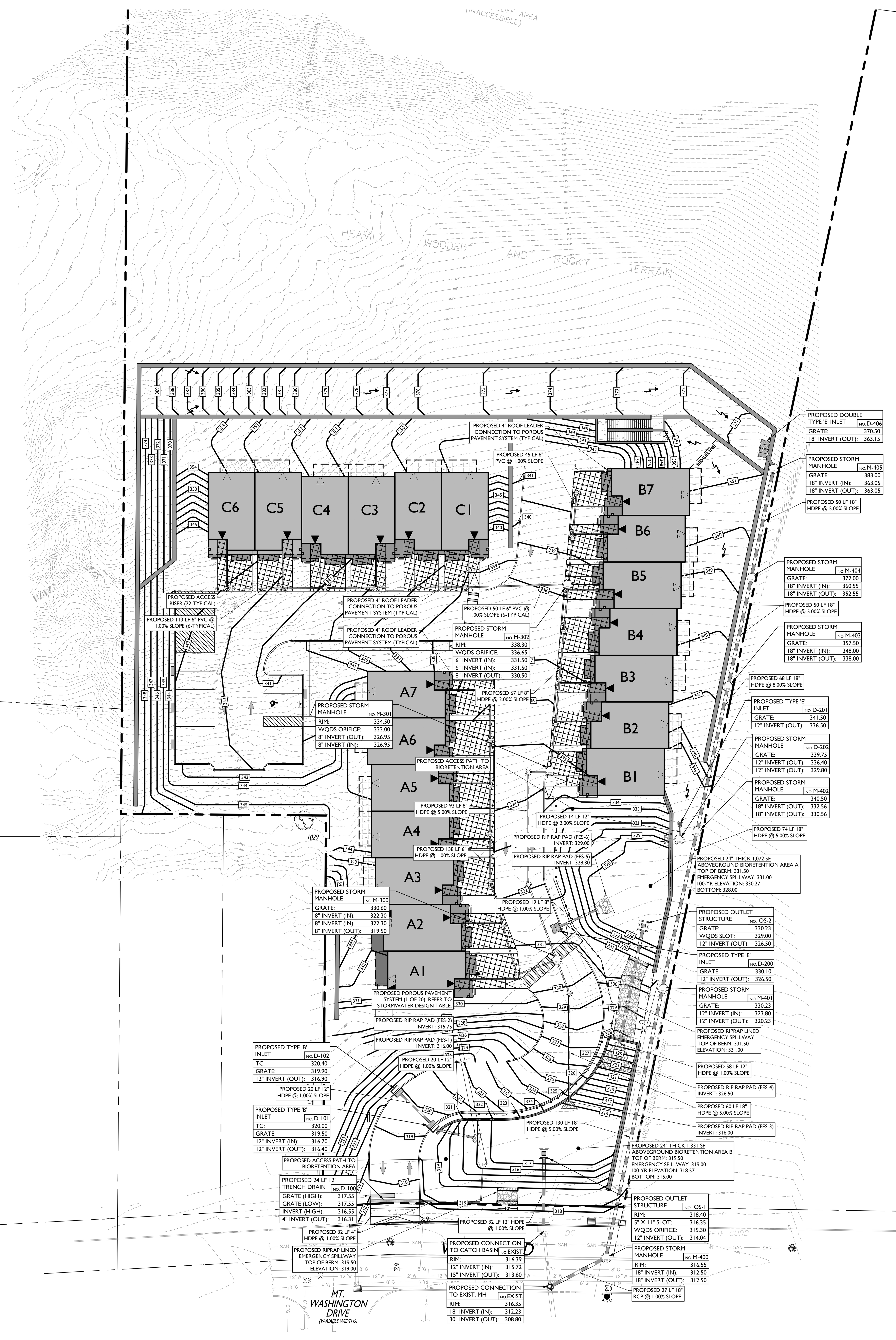
STONEFIELD engineering & design

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

TITLE: SITE PLAN

DRAWING: C-5

APPENDIX A-2:
DRAINAGE PLAN



SYMBOL	DESCRIPTION
	PROPERTY LINE
100	PROPOSED GRADING CONTOUR
RIDGELINE	PROPOSED GRADING RIDGELINE
	PROPOSED STORMWATER STRUCTURES
	PROPOSED STORMWATER PIPING
	PROPOSED UNDERGROUND OUTLET STRUCTURE
	PROPOSED POROUS PAVEMENT SYSTEM

CITY OF CLIFTON DRAINAGE AND UTILITY NOTES

1. FOR CONFORMANCE WITH THE NEW JERSEY STORMWATER BEST MANAGEMENT PRACTICES (BMP) MANUAL, THE SEASONAL GROUNDWATER TABLE SHALL ALSO BE CONFIRMED AT AN ELEVATION TWO (2) OR MORE FEET BELOW THE PROPOSED BOTTOM OF THE PROPOSED INFILTRATION SYSTEM.
2. THE APPLICANT SHALL BE RESPONSIBLE FOR ANY NEGATIVE DRAINAGE IMPACTS TO ADJACENT PROPERTIES DUE TO ON-SITE IMPROVEMENTS. SHOULD NEGATIVE IMPACTS BE IDENTIFIED UPON COMPLETION OF THE PROJECT, THE IMPACT SHALL NE ADDRESSED IMMEDIATELY.

DRAINAGE AND UTILITY NOTES

1. THE CONTRACTOR TO PERFORM A TEST PIT PRIOR TO CONSTRUCTION (RECOMMEND 30 DAYS PRIOR) AT LOCATIONS OF EXISTING UTILITY CROSSINGS FOR STORMWATER IMPROVEMENTS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IN WRITING.
2. CONTRACTOR SHALL START CONSTRUCTION OF STORM LINES AT THE LOWEST INVERT AND WORK UP-GRADIENT.
3. THE CONTRACTOR IS REQUIRED TO CALL THE APPROPRIATE AUTHORITY FOR NOTICE OF CONSTRUCTION/EXCAVATION AND UTILITY MARK OUT PRIOR TO THE START OF CONSTRUCTION IN ACCORDANCE WITH STATE LAW. CONTRACTOR IS REQUIRED TO CONFIRM THE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES IN THE FIELD. SHOULD A DISCREPANCY EXIST BETWEEN THE FIELD LOCATION OF A UTILITY AND THE LOCATION SHOWN ON THE PLAN SET OR SURVEY, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IMMEDIATELY IN WRITING.
4. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD OF THE AS-BUILT LOCATIONS OF ALL PROPOSED UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR SHALL NOTE ANY DISCREPANCIES BETWEEN THE AS-BUILT LOCATIONS AND THE LOCATIONS DEPICTED WITHIN THE PLAN SET. THIS RECORD SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.

EXCAVATION, SOIL PREPARATION, AND DEWATERING NOTES

1. THE CONTRACTOR IS REQUIRED TO REVIEW THE REFERENCED GEOTECHNICAL DOCUMENTS PRIOR TO CONSTRUCTION, THESE DOCUMENTS SHALL BE CONSIDERED A PART OF THE PLAN SET.
2. THE CONTRACTOR IS REQUIRED TO PREPARE SUBGRADE SOILS BENEATH ALL PROPOSED IMPROVEMENTS AND BACKFILL ALL EXCAVATIONS IN ACCORDANCE WITH RECOMMENDATIONS BY THE GEOTECHNICAL ENGINEER OF RECORD.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SHORING FOR ALL EXCAVATIONS AS REQUIRED. CONTRACTOR SHALL HAVE THE SHORING DESIGN PREPARED BY A QUALIFIED PROFESSIONAL. SHORING DESIGNS SHALL BE SUBMITTED TO STONEFIELD ENGINEERING & DESIGN, LLC. AND THE OWNER PRIOR TO THE START OF CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL OPEN EXCAVATIONS ARE PERFORMED AND PROTECTED IN ACCORDANCE WITH THE LATEST OSHA REGULATIONS.
5. THE CONTRACTOR IS RESPONSIBLE FOR ANY DEWATERING DESIGN AND OPERATIONS, AS REQUIRED, TO CONSTRUCT THE PROPOSED IMPROVEMENTS. THE CONTRACTOR SHALL OBTAIN ANY REQUIRED PERMITS FOR DEWATERING OPERATIONS AND GROUNDWATER DISPOSAL.

STORMWATER INFILTRATION BMP CONSTRUCTION NOTES

1. PRIOR TO THE START OF CONSTRUCTION, ANY AREA DESIGNATED TO BE USED FOR AN INFILTRATION BMP (E.G. BASIN, BIORETENTION AREA, ETC.) SHALL BE FENCED OFF AND SHALL NOT BE UTILIZED AS STORAGE FOR CONSTRUCTION EQUIPMENT OR AS A STOCKPILE AREA FOR CONSTRUCTION MATERIALS. NO ACTIVITY SHALL BE PERMITTED WITHIN THE INFILTRATION BASIN AREA UNLESS RELATED TO THE CONSTRUCTION OF THE INFILTRATION BASIN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY ALL SUBCONTRACTORS OF BASIN AREA RESTRICTIONS.
2. THE CONTRACTOR SHALL MAKE EVERY EFFORT, WHERE PRACTICAL, TO AVOID SUBGRADE SOIL COMPACTION IN THE AREAS DESIGNATED TO BE USED FOR AN INFILTRATION BMP.
3. ALL EXCAVATION WITHIN THE LIMITS OF ANY INFILTRATION BMP SHALL BE PERFORMED WITH THE LIGHTEST PRACTICAL EXCAVATION EQUIPMENT. ALL EXCAVATION EQUIPMENT SHALL BE PLACED OUTSIDE THE LIMITS OF THE BASIN WHERE FEASIBLE. THE USE OF LIGHT-WEIGHT, RUBBER-TIRED EQUIPMENT (LESS THAN 8 PSI APPLIED TO THE GROUND SURFACE) IS RECOMMENDED WITHIN THE BASIN LIMITS.
4. THE SEQUENCE OF SITE CONSTRUCTION SHALL BE COORDINATED WITH BASIN CONSTRUCTION TO ADHERE TO SEQUENCING LIMITATIONS.
5. DURING THE FINAL GRADING OF AN INFILTRATION BASIN, THE BOTTOM OF THE BASIN SHALL BE DEEPLY TILLED WITH A ROTARY TILLER OR DISC HARROW AND THEN SMOOTHED OUT WITH A LEVELING DRAW OR EQUIVALENT GRADING EQUIPMENT. ALL GRADING EQUIPMENT SHALL BE LOCATED OUTSIDE OF THE BASIN BOTTOM WHERE FEASIBLE.
6. FOLLOWING CONSTRUCTION OF AN INFILTRATION BASIN, SOIL INFILTRATION TESTING BY A LICENSED GEOTECHNICAL ENGINEER IS REQUIRED TO CERTIFY COMPLIANCE WITH THE DESIGN INFILTRATION RATES IN ACCORDANCE WITH APPENDIX E OF THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S BEST MANAGEMENT PRACTICES MANUAL, LATEST EDITION. IF THE FIELD INFILTRATION RATES ARE LOWER THAN THE RATE USED DURING DESIGN, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IN WRITING IMMEDIATELY TO DETERMINE THE APPROPRIATE COURSE OF ACTION.
7. THE CONTRACTOR SHALL NOTIFY THE MUNICIPALITY TO DETERMINE IF WITNESS TESTING IS REQUIRED DURING INFILTRATION BASIN EXCAVATION AND/OR SOIL INFILTRATION TESTING.

STORMWATER DESIGN TABLE

POROUS PAVEMENT SYSTEMS

POROUS PAVEMENT SYSTEM ID	POROUS PAVEMENT AREA (SF)	LOADING RATIO	GRADE LOW (FT)	SYSTEM STONE PROFILE (FT)	TOP OF STONE (FT)	100 YR STORM ELEV. (FT)	WQ STORM ELEV. (FT)	BOTTOM OF STONE (FT)	2.5" ORIFICE ELEV. (FT)
A1	435	1.92	329.10	1.25	329.85	329.76	329.08	328.60	329.10
A2	424	2.91	329.25	1.75	330.50	329.94	329.24	328.75	329.25
A3	393	2.39	330.84	1.50	331.84	331.68	330.91	330.34	330.95
A4	400	2.27	331.32	2.00	332.82	332.11	331.37	330.82	331.40
A5	434	1.98	332.50	1.50	333.50	333.30	332.55	332.00	332.60
A6	435	2.12	333.50	1.50	334.50	333.52	334.26	333.00	333.55
A7	434	2.07	334.25	1.50	335.25	334.94	334.24	333.75	334.25
B1	305	2.95	332.80	1.50	333.80	333.74	332.99	332.30	333.00
B2	350	2.82	333.50	1.50	334.50	334.48	333.65	333.00	333.70
B3	345	2.61	334.80	1.50	335.80	335.67	334.92	334.30	334.95
B4	350	2.53	335.50	1.50	336.50	336.61	335.59	335.00	335.60
B5	345	2.61	336.50	1.50	337.50	337.37	336.62	336.00	336.65
B6	350	2.53	337.25	1.50	338.25	338.06	337.34	336.75	337.35
B7	345	2.48	338.50	1.50	339.50	339.34	338.60	338.00	338.50
C1	322	2.81	336.50	1.50	337.50	337.44	336.66	336.00	336.70
C2	367	2.33	337.00	1.50	338.00	337.78	337.06	336.50	337.10
C3	333	2.69	338.40	1.50	339.40	339.23	338.53	337.90	338.55
C4	333	2.57	338.50	1.50	339.50	339.35	338.61	338.00	330.65
C5	343	2.70	340.30	1.50	341.30	341.19	340.44	339.80	340.45
C6	343	2.56	340.50	1.50	341.50	341.36	340.61	340.00	340.65

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

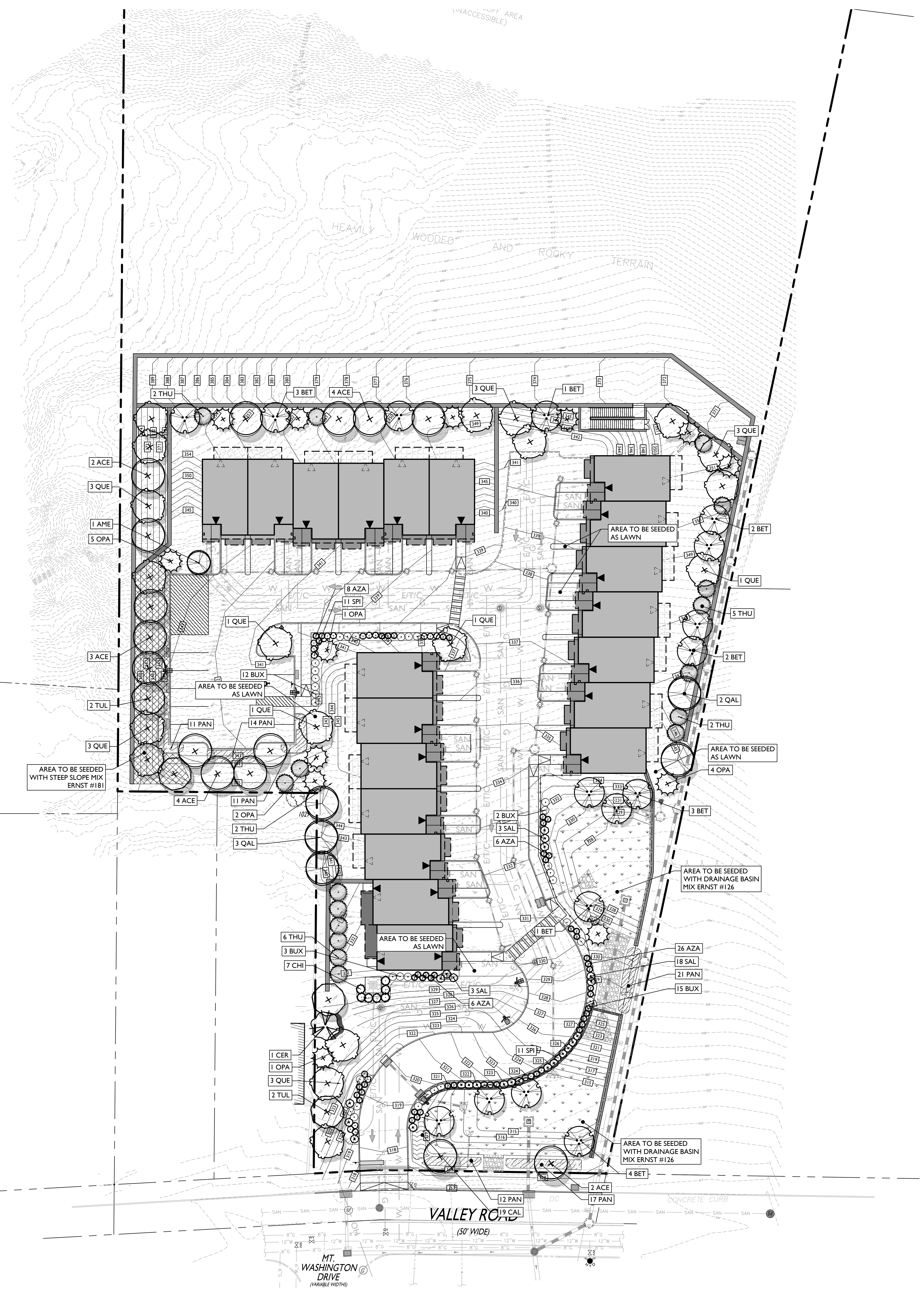
TITLE:

DRAINAGE PLAN

DRAWING:

C-8

APPENDIX A-3:
LANDSCAPING PLAN



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 MULTITRUNK	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):

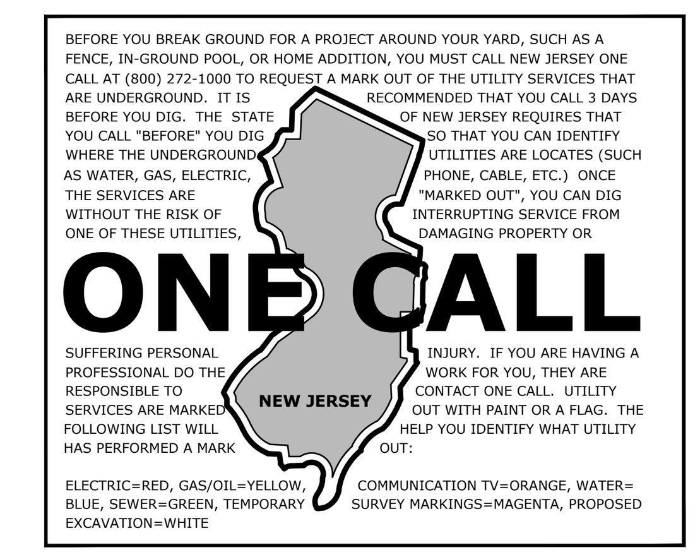
SORGHASTRUM NUTANS	INDIAN GRASS	31.1%
LOLIUM MULTIFLORUM	ANNUAL RYE GRASS	20%
ANDROPOGON GERARDII	BIG BLUE STEM 'NIAGARA'	14%
ELYMUS CANADENSIS	CANADA WILDRYE	7%
AGROSTIS PERENNANS	ALBANY PINE BUSH	4%
PANICUM VERGATUM	SWITCHGRASS	4%
PANICUM CLANDESTINUM	DEER TONGUE	3%
ECHINACEA PURPUREA	PURPLE CONEFLOWER	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

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
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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" = 30' PROJECT ID: RUT-220013

TITLE: LANDSCAPING PLAN

DRAWING: C-13

APPENDIX B
PROJECT SOILS

INVENTORY

B-1: NRCS SOILS REPORT

B-2: WHITESTONE REPORT OF LIMITED GEOTECHNICAL INVESTIGATION

B-3: WHITESTONE STORMWATER MANAGEMENT AREA EVALUATION

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

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

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

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Passaic County, New Jersey
Survey Area Data: Version 17, Aug 30, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 15, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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

WHITESTONE
An Employee-Owned Company

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

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

designed to resist at-rest earth pressures. Such structures should be properly designed by the Owner's engineer. The following soil parameters apply to the encountered subsurface strata and may be used for design of the proposed temporary and permanent retaining structures.

LATERAL EARTH PRESSURE PARAMETERS			
Parameter	**On-Site Granular Soils**	**On-Site Fine-Grained Soils**	**Imported Granular Backfill**
Moist Density (γ_{moist})	140 pcf	135 pcf	130 pcf
Internal Friction Angle (φ)	30°	28°	30°
Active Earth Pressure Coefficient (K_a)	0.33	0.39	0.33
Passive Earth Pressure Coefficient (K_p)	3.00	2.56	3.00
At-Rest Earth Pressure Coefficient (K_o)	0.50	0.56	0.50

Lateral earth pressure will depend on the backfill slope angle and the wall batter angle. A sloped backfill will add surcharge load and affect the angle of the resultant force. The effect of other surcharges will also need to be included in earth pressure calculations, including the loads imposed by adjacent structures and traffic. The effects of proposed sloped backfill surface grades, and proposed slopes beyond the toe of the retaining structure, if applicable, must be considered when calculating resultant forces to be resisted by the retaining structure. A coefficient of friction of 0.35 against sliding can be used for concrete on the existing site soils. Retaining wall footings should be designed so that the combined effect of vertical and horizontal resultants and overturning moment does not exceed the maximum soil bearing capacity provided in Section 5.4.

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind the proposed retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Portions of the on-site soils may be suitable for retaining wall backfill, pending approval from the wall designer. Imported granular soils also may be required. A maximum density of 140 pcf should not be exceeded to avoid creating excessive lateral pressure on the walls during compaction operations.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

6.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. Any overexcavation of existing fill (although not anticipated) within the proposed building footprint area should be witnessed and documented by the owner's geotechnical engineer. The placement of structural backfill within the building structures and behind retaining walls as well as the placement and overexcavation of unsuitable soils also should be documented by the owner's geotechnical engineer.

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to 522 Valley Estates, LLC. Please contact us with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Kyle J. Kopacz, P.E.
Associate

Laurence W. Keller, P.E.
Vice-President

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Enclosure
Copy: Tristan D. Jovanov, Whitestone Associates, Inc.

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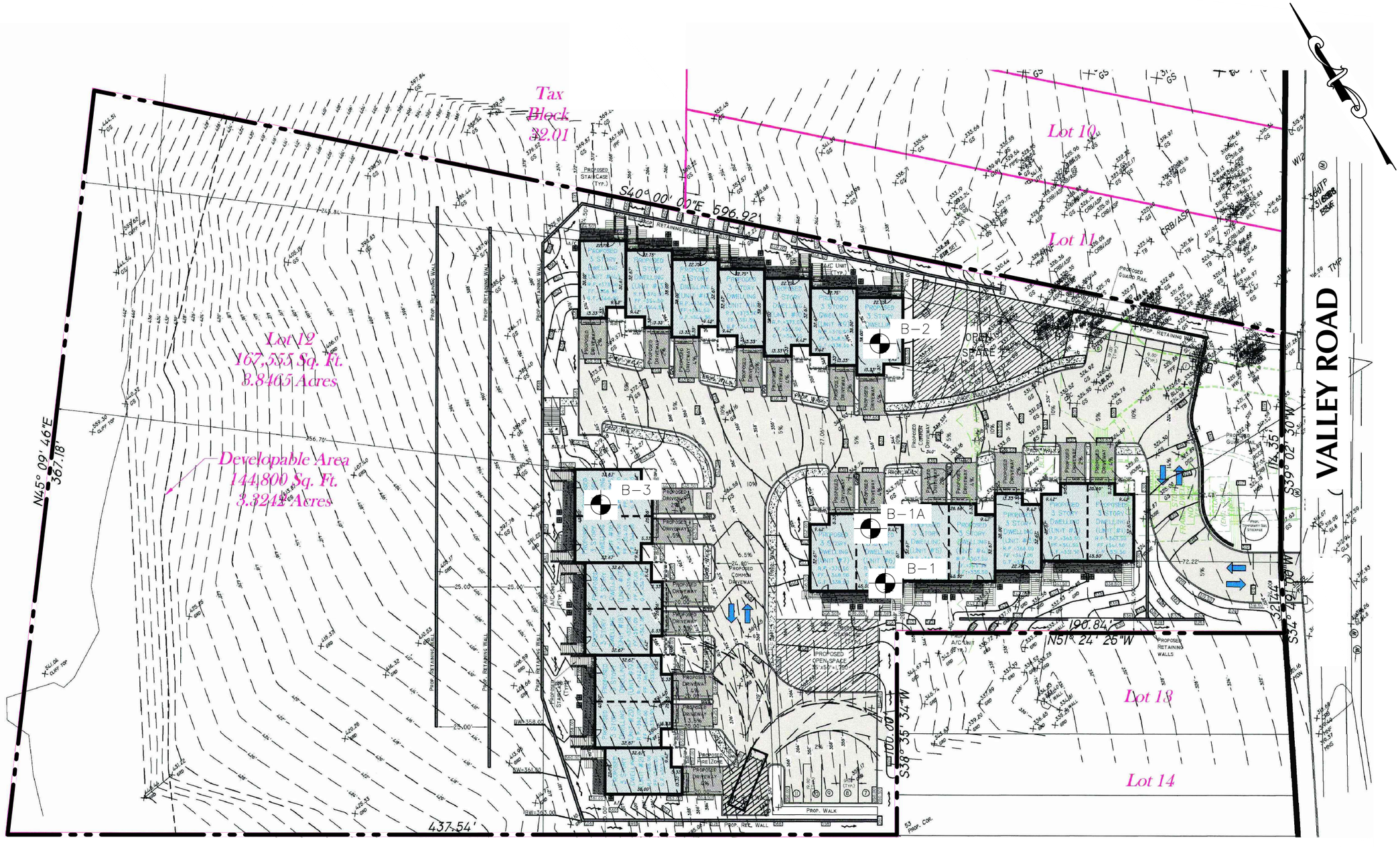
FIGURE 1
Boring Location Plan



0 50

1 inch = 50 ft.

LEGEND

B-1 BORING

SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON AN OCTOBER 14, 2021 SITE PLAN PREPARED BY KOESTNER ASSOCIATES & ALL SITE LOCATIONS ARE APPROXIMATE.

WHITESTONE
An Employee-Owned Company
30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: **BORING LOCATION PLAN**

CLIENT: **522 VALLEY ESTATES, LLC**

PROJECT: **PROPOSED RESIDENTIAL REDEVELOPMENT**
522 VALLEY ROAD
CLIFTON, PASSAIC COUNTY, NJ

PROJECT #: GJ2219439.000	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 8/17/22	FIGURE: 1
SCALE: 1" = 50'	

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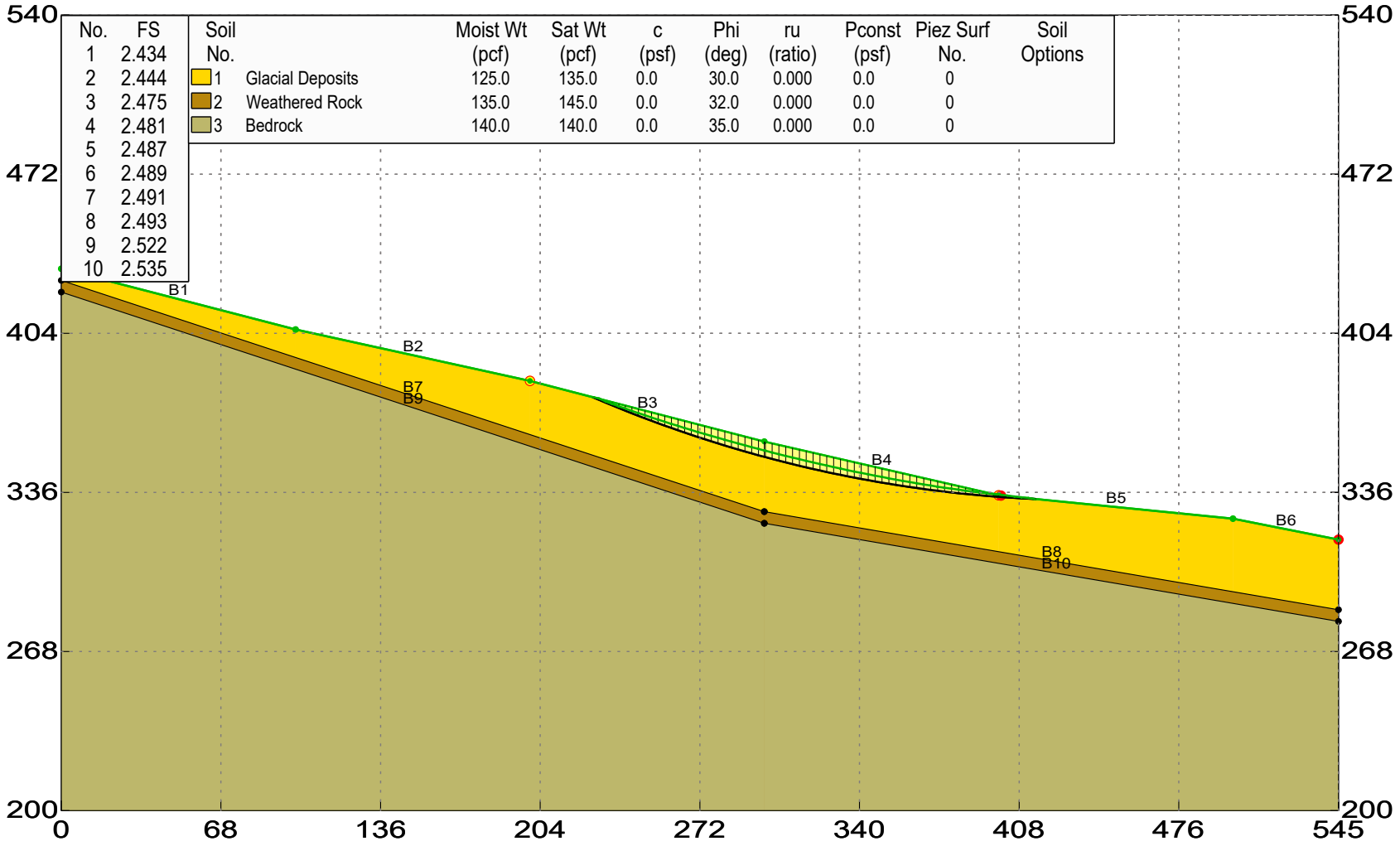
WHITESTONE

FIGURE 2
Slope Stability Analyses

Proposed Residential Development
GJ2219439.000

Whitestone Associates, Inc.

\Existing Conditions.gsd



No.	FS
1	2.434
2	2.444
3	2.475
4	2.481
5	2.487
6	2.489
7	2.491
8	2.493
9	2.522
10	2.535

Soil No.		Moist Wt (pcf)	Sat Wt (pcf)	c (psf)	Phi (deg)	ru (ratio)	Pconst (psf)	Piez Surf No.	Soil Options
1	Glacial Deposits	125.0	135.0	0.0	30.0	0.000	0.0	0	
2	Weathered Rock	135.0	145.0	0.0	32.0	0.000	0.0	0	
3	Bedrock	140.0	140.0	0.0	35.0	0.000	0.0	0	

GEOSTASE FS = 2.434

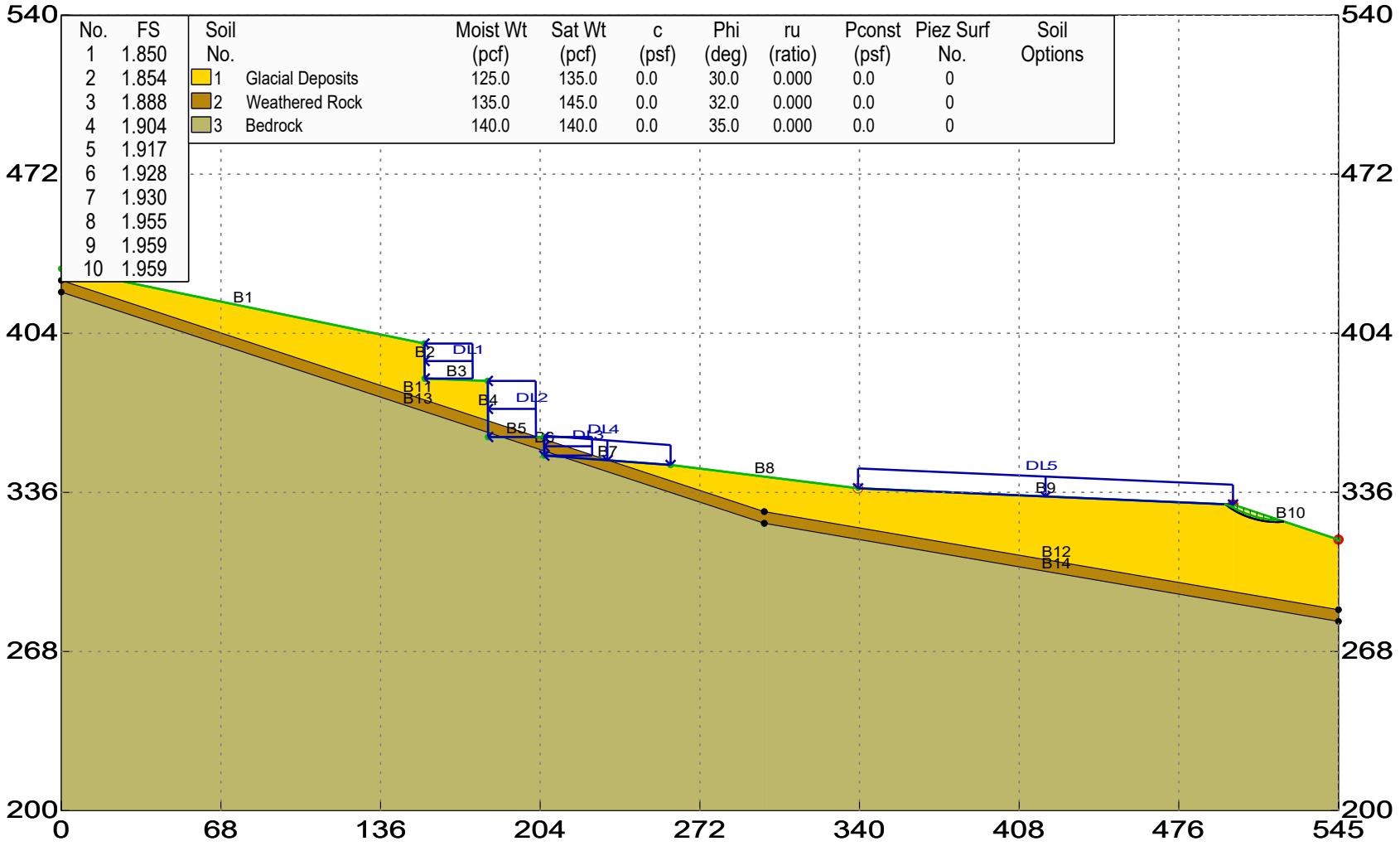
Spencer Method

GEOSTASE
Slope Stability
Analysis

Proposed Residential Development
GJ2219439.000

Whitestone Associates, Inc.

\Proposed Conditions.gsd



GEOSTASE FS = 1.850

Spencer Method

GEOSTASE Slope Stability Analysis

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 330.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**	**Cave-In Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	35.0 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | 330.0		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | 330.0	**At Completion:**	30.0 | 300.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		6 - 6 - 7 - 9	6	13		TOPSOIL		2" Topsoil	
							GLACIAL DEPOSITS		Brown Silty Sand with Gravel, Moist, Medium Dense (SM)	
						2.0				
2 - 4	S-2		14 - 15 - 11 - 9	4	26				As Above (SM)	
						4.0				
						5.0				
5 - 7	S-3		9 - 12 - 16 - 16	24	28				Reddish-Brown Sandy Silt with Gravel, Moist, Very Stiff (ML)	
						7.0				
7 - 8.3	S-4		28 - 31 - 50/4"	24	81/10"				As Above (ML)	2.5 tsf
						8.3				
						10.0				
10 - 12	S-5		32 - 38 - 42 - 0	24	80				Reddish-Brown Silty Sand with Gravel, Moist, Very Dense (SM)	
						12.0				
									As Above (SM)	
						15.0				
15 - 17	S-6		22 - 36 - 48 - 53	24	84				Reddish-Brown Sandy Silt, Moist, Very Stiff (ML)	3.5 tsf
						17.0				
						20.0				
20 - 22	S-7		43 - 26 - 36 - 30	20	62				Reddish-Brown Silty Sand, Moist, Very Dense (SM)	
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B -1

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 330.0 feet	**Date Started:**	8/15/2022		
Termination Depth:	35.0 feet bgs	**Date Completed:**	8/16/2022		
Proposed Location:	Building Pad	**Logged By:**	RL	**During:** NE | 330.0	
Drill / Test Method:	HSA / SPT	**Contractor:**	ETD	**At Completion:** NE | 330.0	**At Completion:** --- | ---
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						25.0	GLACIAL DEPOSITS		As Above (SM)	
25 - 26.2	S-8	X	44 - 50 - 50/2	21	100/8					
						30.0				
30 - 30.25	S-9	X	50/3	3	50/3		WEATHERED ROCK		Reddish-Brown Weathered Rock with Silt, Wet, Very Dense (WR)	
						35.0				
35 - 35	S-10	X	50/0	NR	30/0				No Recovery Presumed As Above	
									Boring Log B-1 Terminated at a Depth of 35.0 Feet Below Ground Surface	
						40.0				
						45.0				
						50.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1A

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 330.0 feet	**Date Started:**	8/16/2022		
Termination Depth:	33.1 feet bgs	**Date Completed:**	8/16/2022		
Proposed Location:	Building Pad	**Logged By:**	RL	**During:** NE | 330.0	
Drill / Test Method:	HSA / SPT	**Contractor:**	ETD	**At Completion:** NE | 330.0	**At Completion:** 30.0 | 300.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						25.0				
						30.0			Offset 20 Feet from B-1	
33 - 33.1	S-1	X	50/1	1	50/1		WR		Reddish-Brown Weathered Rock (WR)	
						35.0			Boring Log B-1A Terminated at a Depth of 00.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 342.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**		**Cave-In Depth (feet bgs) | Elevation (feet)**
Termination Depth:	10.0 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | ---		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | ---	**At Completion:**	10.0 | 332.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TOPSOIL		2" Topsoil	
0 - 2	S-1		2 - 7 - 24 - 24	2	32		GLACIAL DEPOSITS		Brown Silty Sand, Dry, Dense (SM)	
						2.0				
2 - 4	S-2		6 - 14 - 18 - 21	2	32				Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry, Dense (SP-SM)	
						4.0				
4 - 6	S-3		12 - 26 - 32 - 48	4	58	5.0			Reddish-Brown Sandy Silt, Dry, Very Stiff (ML)	
6 - 8	S-4		32 - 48 - 61 - 69	8	109	7.0			Reddish-Brown Silty Gravel, Dry, Very Dense (SM)	
8 - 10	S-5		33 - 42 - 31 - 29	10	73	8.3			As Above, Moist (SM)	
						10.0			Boring Log B-2 Terminated at a Depth of 10.0 Feet Below Ground Surface	
						12.0				
						15.0				
						17.0				
						20.0				
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 382.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**	**Cave-In Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	4.75 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | ---		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | ---	**At Completion:**	4.0 | 378.0
	Tripod	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

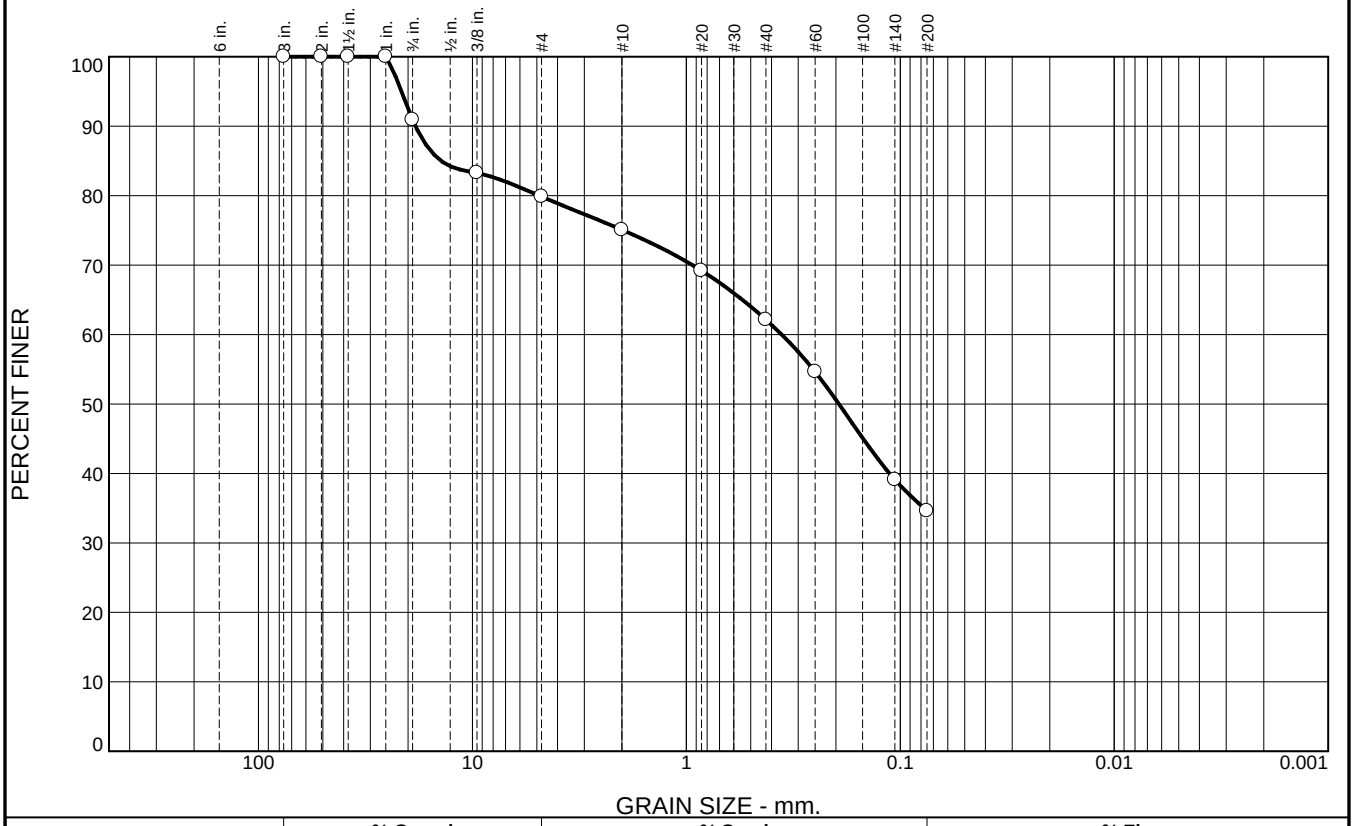
SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TOPSOIL		3" Topsoil	
0 - 2	S-1		5 - 7 - 29 - 35	3	32		GLACIAL DEPOSITS		Brown Silty Sand with Gravel, Dry, Dense (SM)	
						2.0				
2 - 3.75	S-2		30 - 41 - 62 - 100/3	6	103				Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry (SP-SM)	
						3.75				
3.75 - 4.75	S-3		52 - 100	1	100/6				As Above (SP-SM)	
						4.75				
									Boring Log B-3 Terminated at a Depth of 4.75 Feet Below Ground Surface Due to Spoon Refusal	
						12.0				
						15.0				
						17.0				
						20.0				
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	11.1	4.7	13.0	27.5	34.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	90.9		
.375	83.3		
#4	79.8		
#10	75.1		
#20	69.2		
#40	62.1		
#60	54.6		
#140	39.1		
#200	34.6		

* (no specification provided)

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= 18 LL= 21 PI= 3

Coefficients

D_{90}= 18.4623 D_{85}= 14.0052 D_{60}= 0.3587
D_{50}= 0.1938 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

W_n = 14.0 %

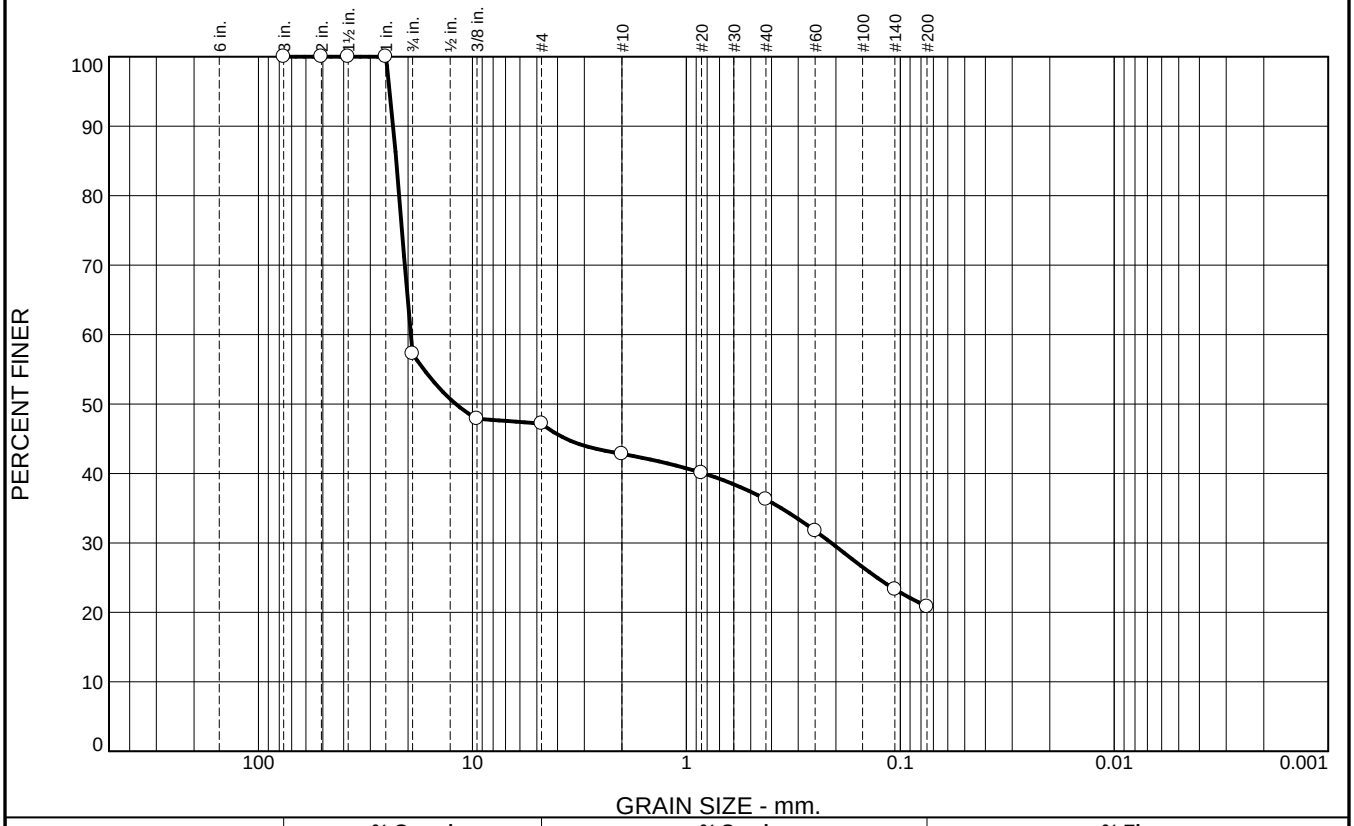
Source of Sample: B-1 **Depth:** 5.0' - 7.0'
Sample Number: S-3

Date: 08/22/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	42.8	10.0	4.4	6.5	15.5	20.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	57.2		
.375	47.9		
#4	47.2		
#10	42.8		
#20	40.1		
#40	36.3		
#60	31.7		
#140	23.3		
#200	20.8		

* (no specification provided)

Material Description

Silty Gravel with Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 23.4385 D_{85}= 22.6889 D_{60}= 19.4336
D_{50}= 11.9606 D_{30}= 0.2103 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

W_n = 4.4 %

Source of Sample: B-3 **Depth:** 2.0' - 4.75'
Sample Number: S-2/S-3

Date: 08/22/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

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APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

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
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	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
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

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 POUNDS 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

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

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

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WARREN, NJ 07059
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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N:	Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu:	Unconfined compressive strength, TSF.
Qp:	Penetrometer value, unconfined compressive strength, TSF.
Mc:	Moisture content, %.
LL:	Liquid limit, %.
PI:	Plasticity index, %.
δd:	Natural dry density, PCF.
▼:	Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE:	Not Encountered (Groundwater was not encountered).
SS:	Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST:	Shelby Tube - 3" O.D., except where noted.
AU:	Auger Sample.
OB:	Diamond Bit.
CB:	Carbide Bit
WS:	Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | WALL, NJ 732.592.2101 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690

WHITESTONE
An Employee-Owned Company

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

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

designed to resist at-rest earth pressures. Such structures should be properly designed by the Owner's engineer. The following soil parameters apply to the encountered subsurface strata and may be used for design of the proposed temporary and permanent retaining structures.

LATERAL EARTH PRESSURE PARAMETERS			
Parameter	**On-Site Granular Soils**	**On-Site Fine-Grained Soils**	**Imported Granular Backfill**
Moist Density (γ_{moist})	140 pcf	135 pcf	130 pcf
Internal Friction Angle (φ)	30°	28°	30°
Active Earth Pressure Coefficient (K_a)	0.33	0.39	0.33
Passive Earth Pressure Coefficient (K_p)	3.00	2.56	3.00
At-Rest Earth Pressure Coefficient (K_o)	0.50	0.56	0.50

Lateral earth pressure will depend on the backfill slope angle and the wall batter angle. A sloped backfill will add surcharge load and affect the angle of the resultant force. The effect of other surcharges will also need to be included in earth pressure calculations, including the loads imposed by adjacent structures and traffic. The effects of proposed sloped backfill surface grades, and proposed slopes beyond the toe of the retaining structure, if applicable, must be considered when calculating resultant forces to be resisted by the retaining structure. A coefficient of friction of 0.35 against sliding can be used for concrete on the existing site soils. Retaining wall footings should be designed so that the combined effect of vertical and horizontal resultants and overturning moment does not exceed the maximum soil bearing capacity provided in Section 5.4.

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind the proposed retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Portions of the on-site soils may be suitable for retaining wall backfill, pending approval from the wall designer. Imported granular soils also may be required. A maximum density of 140 pcf should not be exceeded to avoid creating excessive lateral pressure on the walls during compaction operations.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

6.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. Any overexcavation of existing fill (although not anticipated) within the proposed building footprint area should be witnessed and documented by the owner's geotechnical engineer. The placement of structural backfill within the building structures and behind retaining walls as well as the placement and overexcavation of unsuitable soils also should be documented by the owner's geotechnical engineer.

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to 522 Valley Estates, LLC. Please contact us with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

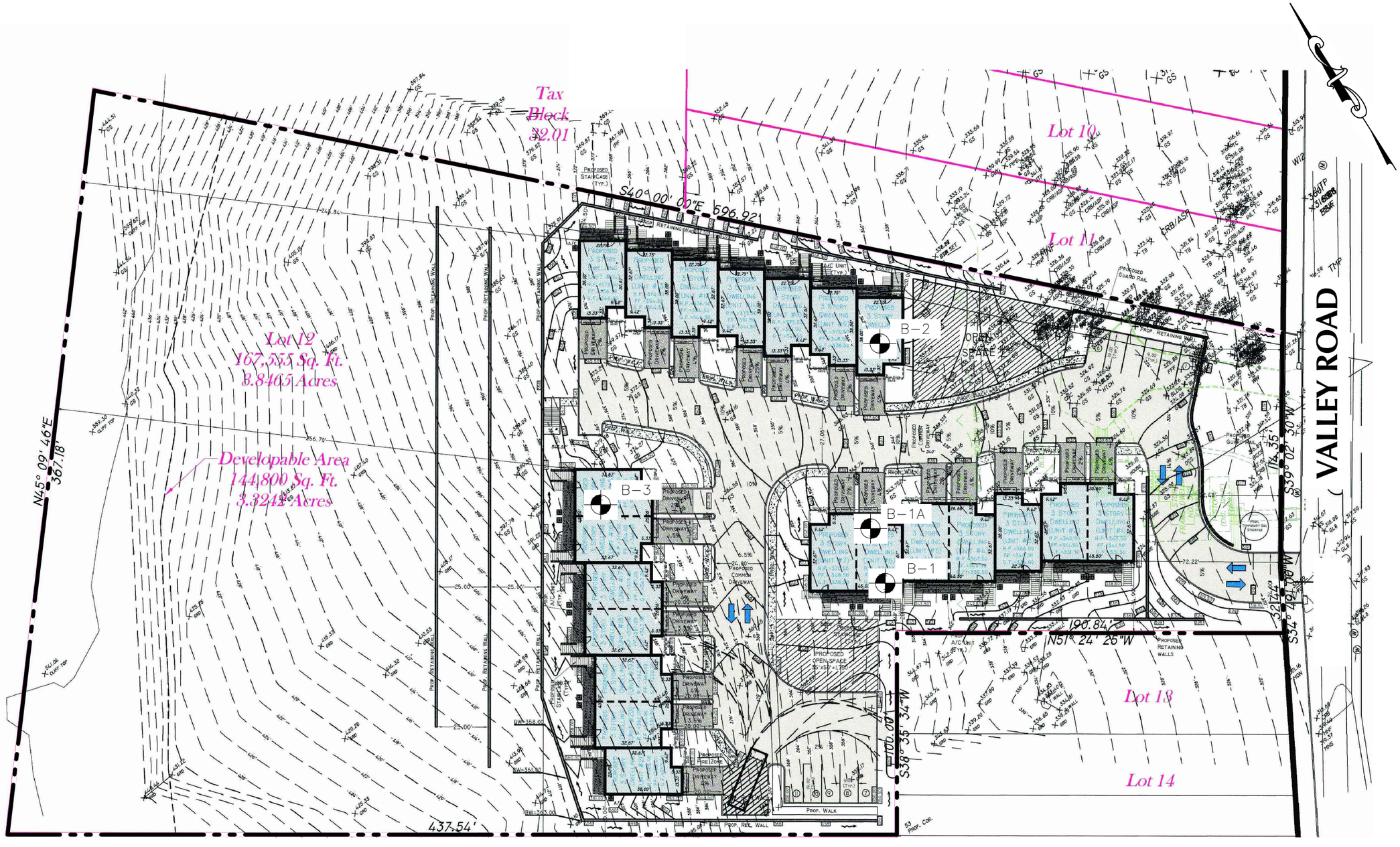
Kyle J. Kopacz, P.E.
Associate

Laurence W. Keller, P.E.
Vice-President

KK/TJ/ri L:\Job Folders\2022\2219439GJ\Reports and Submittals\19439 LimGI.docx
Enclosure
Copy: Tristan D. Jovanov, Whitestone Associates, Inc.

WHITESTONE

FIGURE 1
Boring Location Plan



0 50

1 inch = 50 ft.

LEGEND

B-1 BORING

SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON AN OCTOBER 14, 2021 SITE PLAN PREPARED BY KOESTNER ASSOCIATES & ALL SITE LOCATIONS ARE APPROXIMATE.

WHITESTONE
An Employee-Owned Company
30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: **BORING LOCATION PLAN**

CLIENT: **522 VALLEY ESTATES, LLC**

PROJECT: **PROPOSED RESIDENTIAL REDEVELOPMENT**
522 VALLEY ROAD
CLIFTON, PASSAIC COUNTY, NJ

PROJECT #: GJ2219439.000	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 8/17/22	FIGURE: 1
SCALE: 1" = 50'	

L:\Job Folders\2022\2219439G\Drawings and Plans\GJ2219439.000 BLP.dwg

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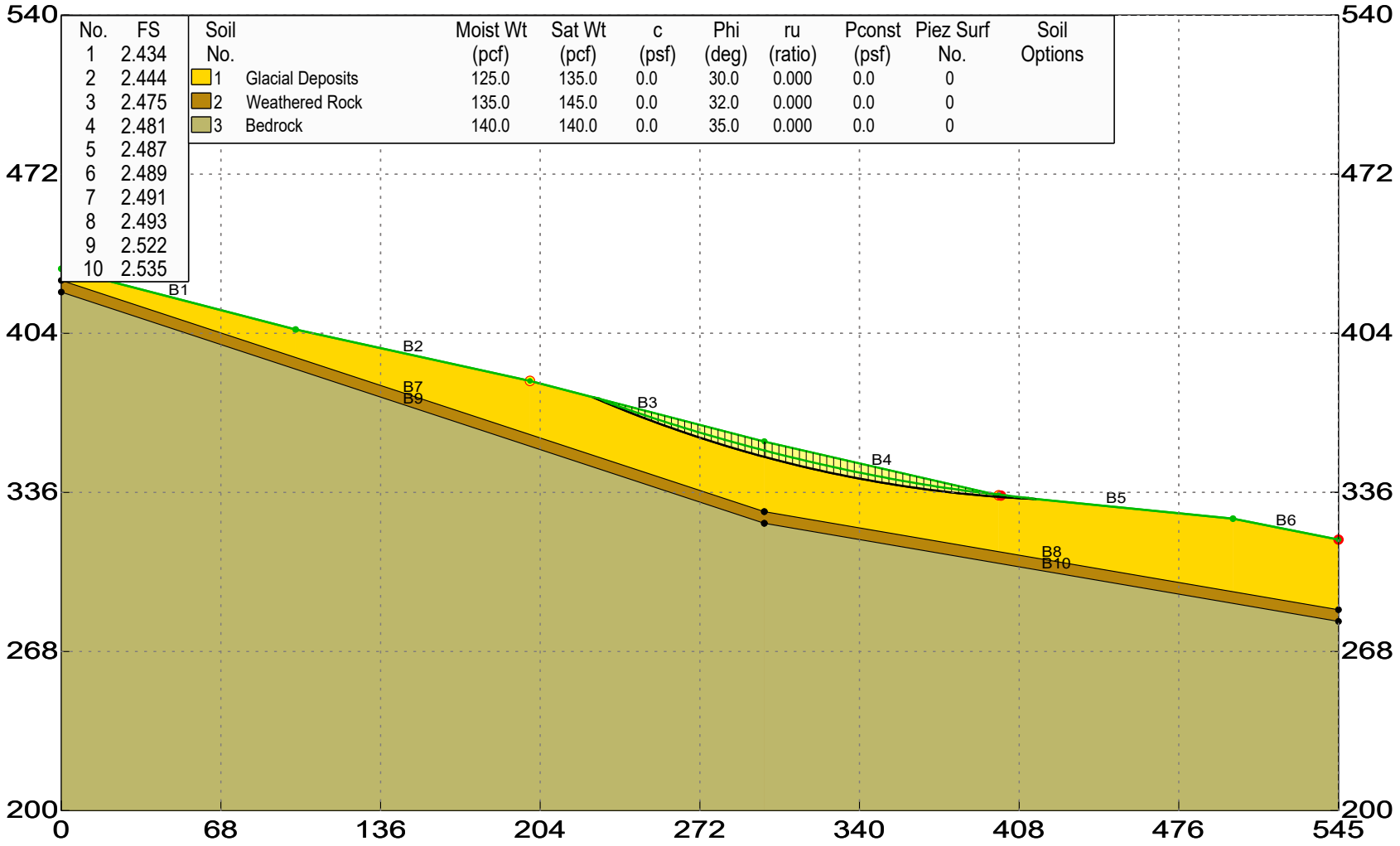
FIGURE 2
Slope Stability Analyses

Proposed Residential Development
GJ2219439.000

Whitestone Associates, Inc.

\Existing Conditions.gsd



No.	FS
1	2.434
2	2.444
3	2.475
4	2.481
5	2.487
6	2.489
7	2.491
8	2.493
9	2.522
10	2.535

Soil No.		Moist Wt (pcf)	Sat Wt (pcf)	c (psf)	Phi (deg)	ru (ratio)	Pconst (psf)	Piez Surf No.	Soil Options
1	Glacial Deposits	125.0	135.0	0.0	30.0	0.000	0.0	0	
2	Weathered Rock	135.0	145.0	0.0	32.0	0.000	0.0	0	
3	Bedrock	140.0	140.0	0.0	35.0	0.000	0.0	0	

GEOSTASE FS = 2.434

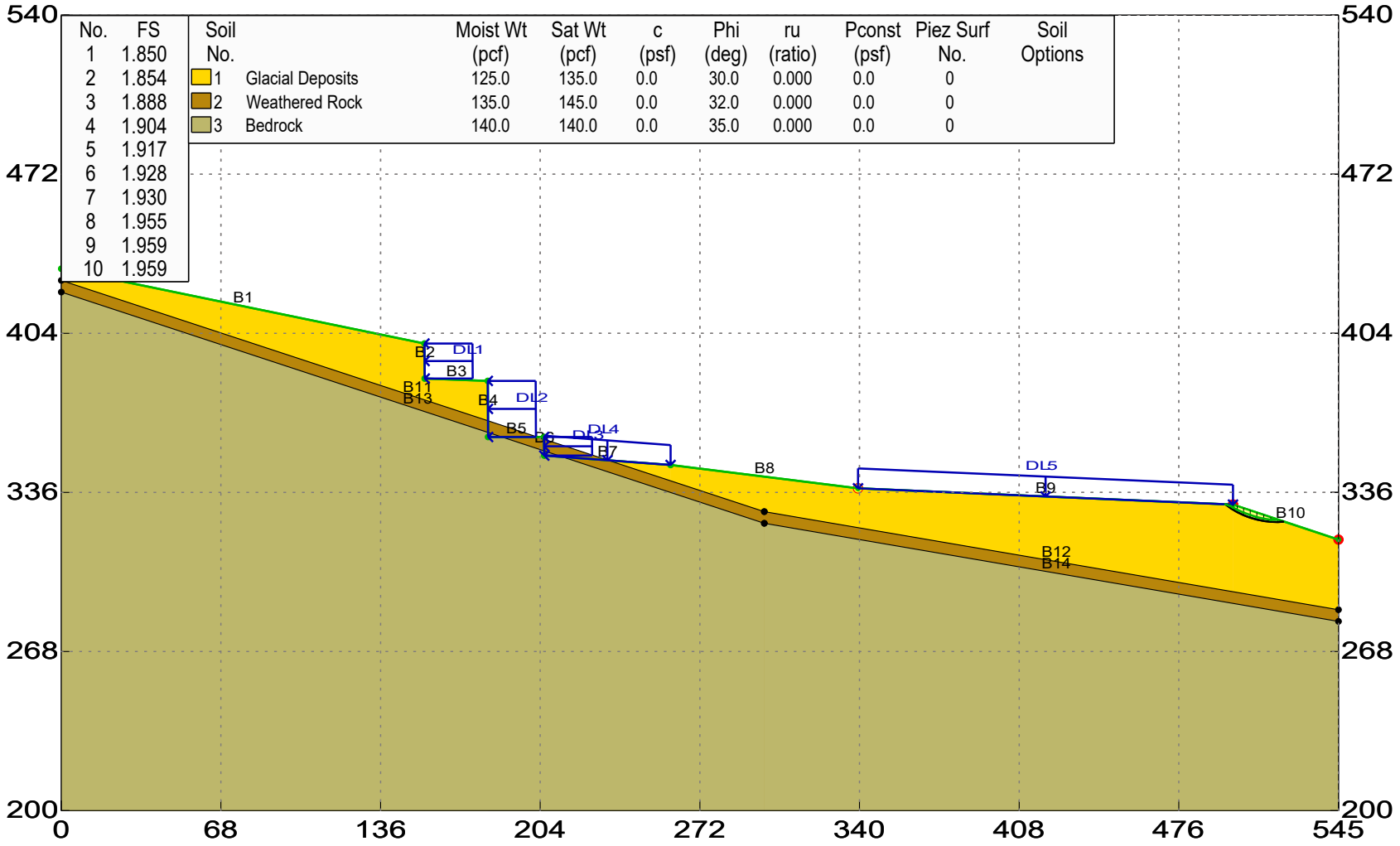
Spencer Method

GEOSTASE
Slope Stability
Analysis

Proposed Residential Development
GJ2219439.000

Whitestone Associates, Inc.

\Proposed Conditions.gsd



GEOSTASE FS = 1.850

Spencer Method

GEOSTASE Slope Stability Analysis

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 330.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**	**Cave-In Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	35.0 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | 330.0		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | 330.0	**At Completion:**	30.0 | 300.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		6 - 6 - 7 - 9	6	13		TOPSOIL		2" Topsoil	
							GLACIAL DEPOSITS		Brown Silty Sand with Gravel, Moist, Medium Dense (SM)	
						2.0				
2 - 4	S-2		14 - 15 - 11 - 9	4	26				As Above (SM)	
						4.0				
						5.0				
5 - 7	S-3		9 - 12 - 16 - 16	24	28				Reddish-Brown Sandy Silt with Gravel, Moist, Very Stiff (ML)	
						7.0				
7 - 8.3	S-4		28 - 31 - 50/4"	24	81/10"				As Above (ML)	2.5 tsf
						8.3				
						10.0				
10 - 12	S-5		32 - 38 - 42 - 0	24	80				Reddish-Brown Silty Sand with Gravel, Moist, Very Dense (SM)	
						12.0				
									As Above (SM)	
						15.0				
15 - 17	S-6		22 - 36 - 48 - 53	24	84				Reddish-Brown Sandy Silt, Moist, Very Stiff (ML)	3.5 tsf
						17.0				
						20.0				
20 - 22	S-7		43 - 26 - 36 - 30	20	62				Reddish-Brown Silty Sand, Moist, Very Dense (SM)	
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B -1

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 330.0 feet	**Date Started:**	8/15/2022		
Termination Depth:	35.0 feet bgs	**Date Completed:**	8/16/2022		
Proposed Location:	Building Pad	**Logged By:**	RL	**During:** NE | 330.0	
Drill / Test Method:	HSA / SPT	**Contractor:**	ETD	**At Completion:** NE | 330.0	**At Completion:** --- | ---
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						25.0	GLACIAL DEPOSITS		As Above (SM)	
25 - 26.2	S-8	X	44 - 50 - 50/2	21	100/8					
						30.0				
30 - 30.25	S-9	X	50/3	3	50/3		WEATHERED ROCK		Reddish-Brown Weathered Rock with Silt, Wet, Very Dense (WR)	
						35.0				
35 - 35	S-10	X	50/0	NR	30/0				No Recovery Presumed As Above	
									Boring Log B-1 Terminated at a Depth of 35.0 Feet Below Ground Surface	
						40.0				
						45.0				
						50.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1A

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 330.0 feet	**Date Started:**	8/16/2022		
Termination Depth:	33.1 feet bgs	**Date Completed:**	8/16/2022		
Proposed Location:	Building Pad	**Logged By:**	RL	**During:** NE | 330.0	
Drill / Test Method:	HSA / SPT	**Contractor:**	ETD	**At Completion:** NE | 330.0	**At Completion:** 30.0 | 300.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						25.0				
						30.0			Offset 20 Feet from B-1	
33 - 33.1	S-1	X	50/1	1	50/1		WR		Reddish-Brown Weathered Rock (WR)	
						35.0			Boring Log B-1A Terminated at a Depth of 00.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 342.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**		**Cave-In Depth (feet bgs) | Elevation (feet)**
Termination Depth:	10.0 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | ---		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | ---	**At Completion:**	10.0 | 332.0
	Mud Rotary	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TOPSOIL		2" Topsoil	
0 - 2	S-1		2 - 7 - 24 - 24	2	32		GLACIAL DEPOSITS		Brown Silty Sand, Dry, Dense (SM)	
						2.0				
2 - 4	S-2		6 - 14 - 18 - 21	2	32				Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry, Dense (SP-SM)	
						4.0				
4 - 6	S-3		12 - 26 - 32 - 48	4	58	5.0			Reddish-Brown Sandy Silt, Dry, Very Stiff (ML)	
6 - 8	S-4		32 - 48 - 61 - 69	8	109	7.0			Reddish-Brown Silty Gravel, Dry, Very Dense (SM)	
8 - 10	S-5		33 - 42 - 31 - 29	10	73	8.3			As Above, Moist (SM)	
						10.0			Boring Log B-2 Terminated at a Depth of 10.0 Feet Below Ground Surface	
						12.0				
						15.0				
						17.0				
						20.0				
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Project:	Proposed Residential Development	**WAI Project No.:**	GJ2219439.000
Location:	522 Valley Road, Clifton, Passaic County, New Jersey	**Client:**	522 Valley Estates, LLC

Surface Elevation:	± 382.0 feet	**Date Started:**	8/15/2022		**Water Depth (feet bgs) | Elevation (feet)**	**Cave-In Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	4.75 feet bgs	**Date Completed:**	8/16/2022				
Proposed Location:	Building Pad	**Logged By:**	RL	**During:**	NE | ---		
Drill / Test Method:	SPT	**Contractor:**	ETD	**At Completion:**	NE | ---	**At Completion:**	4.0 | 378.0
	Tripod	**Equipment:**	CME 75	**24 Hours:**	--- | ---	**24 Hours:**	--- | ---

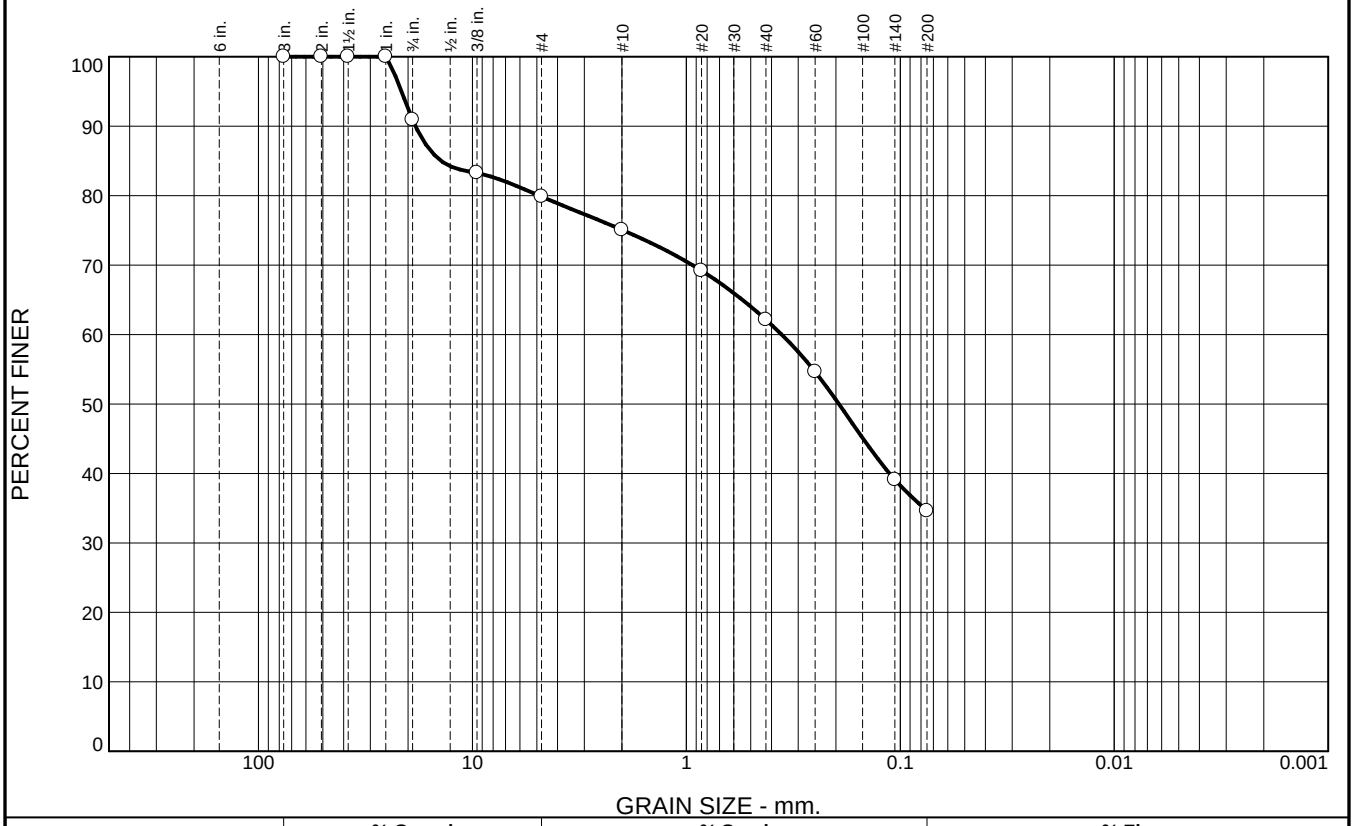
SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TOPSOIL		3" Topsoil	
0 - 2	S-1		5 - 7 - 29 - 35	3	32		GLACIAL DEPOSITS		Brown Silty Sand with Gravel, Dry, Dense (SM)	
						2.0				
2 - 3.75	S-2		30 - 41 - 62 - 100/3	6	103				Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry (SP-SM)	
						3.75				
3.75 - 4.75	S-3		52 - 100	1	100/6				As Above (SP-SM)	
						4.75				
									Boring Log B-3 Terminated at a Depth of 4.75 Feet Below Ground Surface Due to Spoon Refusal	
						12.0				
						15.0				
						17.0				
						20.0				
						22.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	11.1	4.7	13.0	27.5	34.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	90.9		
.375	83.3		
#4	79.8		
#10	75.1		
#20	69.2		
#40	62.1		
#60	54.6		
#140	39.1		
#200	34.6		

* (no specification provided)

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= 18 LL= 21 PI= 3

Coefficients

D_{90}= 18.4623 D_{85}= 14.0052 D_{60}= 0.3587
D_{50}= 0.1938 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

W_n = 14.0 %

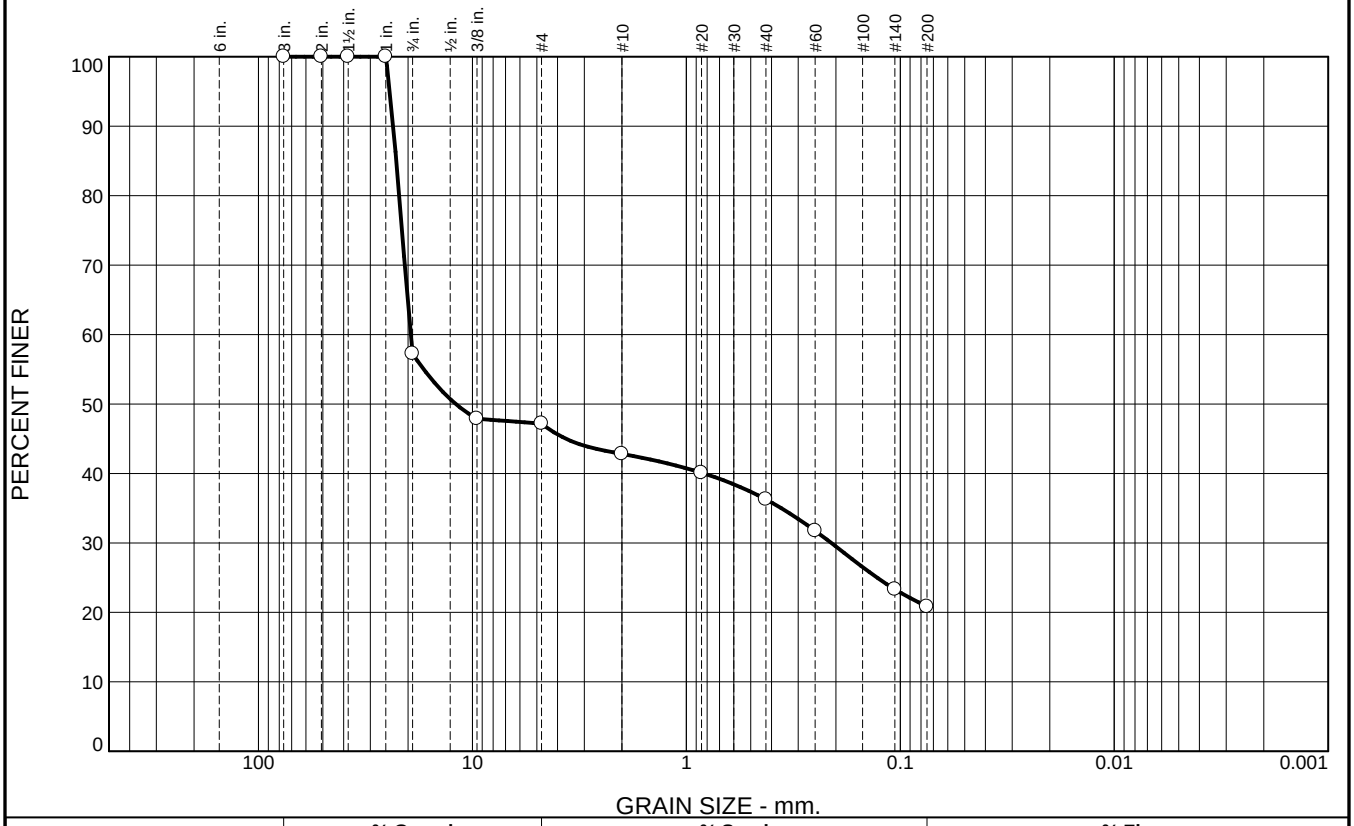
Source of Sample: B-1 **Depth:** 5.0' - 7.0'
Sample Number: S-3

Date: 08/22/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	42.8	10.0	4.4	6.5	15.5	20.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	57.2		
.375	47.9		
#4	47.2		
#10	42.8		
#20	40.1		
#40	36.3		
#60	31.7		
#140	23.3		
#200	20.8		

* (no specification provided)

Material Description

Silty Gravel with Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 23.4385 D_{85}= 22.6889 D_{60}= 19.4336
D_{50}= 11.9606 D_{30}= 0.2103 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

W_n = 4.4 %

Source of Sample: B-3 **Depth:** 2.0' - 4.75'
Sample Number: S-2/S-3

Date: 08/22/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

WHITESTONE

APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

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
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	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
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

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 POUNDS 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

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

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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N:	Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu:	Unconfined compressive strength, TSF.
Qp:	Penetrometer value, unconfined compressive strength, TSF.
Mc:	Moisture content, %.
LL:	Liquid limit, %.
PI:	Plasticity index, %.
δd:	Natural dry density, PCF.
▼:	Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE:	Not Encountered (Groundwater was not encountered).
SS:	Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST:	Shelby Tube - 3" O.D., except where noted.
AU:	Auger Sample.
OB:	Diamond Bit.
CB:	Carbide Bit
WS:	Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | WALL, NJ 732.592.2101 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690

APPENDIX C:
INSPECTION CHECKLISTS

APPENDIX C-1:
GENERAL INSPECTION CHECKLIST LOG

INSPECTION CHECKLIST LOG

1. **The responsible party shall report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.**
2. **The maintenance crew should fill out the checklist in the field manual when performing each inspection/maintenance task.**
3. **After the maintenance task is performed, the checklist should be filed in the Maintenance Plan and recorded in the log below.**

Cycle of Inspection	***Stormwater Management Measure No.***	***Checklist No.***	***Date(s) of Inspection***
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4^{th} Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

Cycle of Inspection	***Stormwater Management Measure No.***	***Checklist No.***	***Date(s) of Inspection***
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

APPENDIX C-2:
GENERAL PREVENTATIVE MAINTENANCE LOG

PREVENTATIVE MAINTENANCE LOG

MAINTENANCE SCHEDULE	STORMWATER MANAGEMENT MEASURE NO.	PREVENTATIVE MAINTENANCE RECORD NO.	DATE(S) OF MAINTENANCE
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Maintenance work; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

Appendix C-3: General Corrective Maintenance Log

CORRECTIVE MAINTENANCE LOG

Maintenance Schedule	*Stormwater Management Measure No.*	*Corrective Maintenance Record No.*	*Date(s) of Maintenance*
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Maintenance work; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

APPENDIX C-4: *ANNUAL EVALUATION RECORD*

ANNUAL EVALUATION RECORD

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Evaluator(s)	***Date of Evaluation***	***Decision***
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)