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REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED BUILDING ADDITION
219 CREEKSIDE DRIVE
SECTION 40.07, BLOCK 1, LOT 3
AMHERST, ERIE COUNTY, NEW YORK

Prepared for:

FRANK P. LANGLEY CO., INC.
219 Creekside Drive
Amherst, New York 14228

Prepared by:

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Ryan R. Roy, P.E.
Vice President

Whitestone Project No.: GR2421508.Y00
March 20, 2024

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March 20, 2024

via email

FRANK P. LANGLEY CO., INC.
219 Creekside Drive
Amherst, New York 14228

Attention: Mr. Scott Crego
President

Regarding: REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED BUILDING ADDITION
219 CREEKSIDE DRIVE
SECTION 40.07, BLOCK 1, LOT 3
AMHERST, ERIE COUNTY, NEW YORK
WHITESTONE PROJECT NO.: GR2421508.Y00

Dear Mr. Crego:

Whitestone Associates Engineering & Geology NY, PLLC (Whitestone) is pleased to submit the attached *Report of Geotechnical Investigation* for the above-referenced project. The report presents the results of Whitestone's site visit and subsurface exploration, and includes design recommendations for the foundations, floor slab, pavements, and related earthwork associated with the proposed building addition.

Whitestone appreciates the opportunity to be of service to Frank P. Langley Co., Inc. Please contact us with any questions or comments regarding the enclosed report.

Sincerely,

WHITESTONE

Charles B. Guzzetta, P.G.
Regional Manager, Upstate New York

Ryan R. Roy, P.E.
Vice President

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Enclosures
Copy: Laurence W. Keller, P.E., Whitestone Associates, Inc.

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GEOTECHNICAL INVESTIGATION
Proposed Building Addition
219 Creekside Drive
Amherst, Erie County, New York

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SECTION 1.0
Summary of Findings

Whitestone has completed an exploration and evaluation of the subsurface conditions for the proposed building addition located at 219 Creekside Drive in Amherst, Erie County, New York. Based on a July 15, 2005 *Site Layout, Grading, Drainage & Utility Plan & Details* prepared by Silvestri Architects, PC, the proposed development will include the construction of a single-story addition to the existing building with a footprint of approximately 4,500 square feet and associated additional pavement, landscaping, and utilities. Whitestone anticipates that the addition will be constructed close to existing grades to match the adjacent development. No new stormwater management facilities or retaining walls are shown on the plan.

The geotechnical investigation included conducting a reconnaissance of the project site, advancing four borings, and collecting soil samples for laboratory testing and characterization. Site subsurface conditions generally consisted of topsoil overlying a limited thickness of existing fill, which is underlain by an alluvial deposit, in turn underlain by a lacustrine deposit. Groundwater was encountered within the borings during the exploration at depths of 6.4 feet below ground surface (fbgs) and 6.5 fbgs.

The subject site is mapped as being underlain by carbonate bedrock that is water soluble and known to be susceptible to solution cavities and void formation that can result in surficial depressions or sinkholes. However, the results of the subsurface investigation, specifically the thickness of soil over the bedrock, were not indicative of an elevated risk for sinkhole development.

The results of the investigation indicate that the proposed addition may be supported on conventional shallow foundations bearing on the properly inspected and approved alluvial deposit or structural fill placed over the alluvial deposit. Existing fill was encountered up to a depth of four fbgs, however, deeper existing fill may be encountered during construction between the widely spaced borings. Any existing fill should be removed below footings and replaced with structural fill. Foundation subgrades should be undercut and replaced with crushed stone wrapped in geotextile separation fabric. The subgrade should be reviewed by the geotechnical engineer, as specified in this report prior to fill placement or structural support. The results of the investigation also indicate the site is suitable for a ground-supported floor slab deriving support from properly inspected and approved compacted existing fill (after removal of significant organic material) and/or compacted structural fill, as specified in this report. Additionally, the site conditions support the use of typical pavement sections using standard New York State Department of Transportation (NYSDOT) specified materials.

The above summary is intended to provide an overview of the geotechnical findings and recommendations and is not fully developed. Greater detail is presented in the following sections. The entire report must be read for comprehensive understanding of the information contained herein.

SECTION 2.0
Introduction

2.1 AUTHORIZATION

Mr. Scott Crego, President of Frank P. Langley Co., Inc., issued authorization to Whitestone to conduct a geotechnical investigation on this site relevant to the construction of a proposed building addition at 219 Creekside Drive in Amherst, Erie County, New York. The geotechnical investigation was conducted in general accordance with Whitestone's February 13, 2024 proposal.

2.2 PURPOSE

The purpose of this exploration and analysis was to:

- ascertain the various soil profile components at test locations;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundation, floor slab, and pavement design;
- provide recommendations for required earthwork and subgrade preparation;
- record groundwater and/or bedrock levels (if encountered) at the time of the investigation and discuss the potential impact on the proposed construction; and
- recommend additional investigation and/or analysis, if warranted.

2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration, field testing and sampling, laboratory analyses, and a geotechnical engineering analysis and evaluation of the subsurface materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction.

2.3.1 Field Exploration

Field exploration of the project site was conducted by means of four borings, identified as B-101 through B-104, advanced with a track-mounted CME 550X drill rig equipped with hollow stem augers. The borings were advanced to termination depths that ranged from eight fbgs to 37 fbgs. Borings were backfilled with excavated materials generated from the investigation. Test locations are shown on the *Boring Location Plan* included as Figure 1.

Test locations were based on project information provided to Whitestone at the time of the investigation, including the aforementioned Silvestri plan. The subsurface tests were conducted in the presence of a Whitestone representative, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. Test locations were established in the field using normal taping procedures and estimated right angles. These locations are presumed to be approximate.

Borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The Standard Penetration 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 earthwork and foundations.

Groundwater level observations, where encountered, were recorded during and immediately following the completion of the field operations prior to backfilling the borings. Seasonal variations, temperature 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 monitoring wells may not be representative of true groundwater levels.

2.3.2 Laboratory Testing

Supplemental laboratory testing was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory testing was conducted in general accordance with applicable ASTM standard test methods and included physical testing of the alluvial and lacustrine deposits.

Physical/Textural Analysis: Representative samples of the site soils were subjected to laboratory testing that included moisture content determination (ASTM D2216) and Atterberg Limits (ASTM D4318) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS). The results of the laboratory testing are summarized in the following table.

LABORATORY PHYSICAL/TEXTURAL ANALYSIS SUMMARY					
Boring	**Sample Number**	**Depth (fbgs)**	**Plastic Limit (%)**	**Liquid Limit (%)**	**USCS Classification**
B-102	S-7	15.0 - 17.0	19	43	CL

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 soil behavior under construction and service loads. Moisture contents are shown on the *Records of Subsurface Exploration.* Other laboratory test results are provided in Appendix B.

SECTION 3.0
Site Description

3.1 LOCATION & DESCRIPTION

The subject property is located at 219 Creekside Drive in Amherst, Erie County, New York, Latitude 42.9632 North, Longitude 78.6974 West. The 2.15-acre property is identified further as Section 40.07, Block 1, Lot 3.

The rectangular site is bounded to the north by Creekside Drive, to the east by undeveloped, mainly wooded land with a large pond, to the south by a large commercial development, and to the west by a single-story commercial building. Access to the site is from Creekside Drive. The site of the proposed construction is shown on the *Boring Location Plan* included as Figure 1.

3.2 EXISTING CONDITIONS

Existing Development: At the time of Whitestone's investigation, the subject site was developed with a single-story office and warehouse building with paved parking.

Topography: Based on a review of the *USGS 7.5 Minute Series Tonawanda East Quadrangle, New York* (2023) and the Silvestri plan, and on Whitestone's visual observations, the site is relatively level at approximately 575 feet above National American Vertical Datum of 1988 (NAVD), with a slight slope down to the north.

Utilities: The site is serviced by electric, gas, and telecommunication utilities and connected to municipal water and sewer services. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

Site Drainage: Surface run-off will generally flow north over the paved surface and to the adjacent roadway, thence into catch basins that are presumed to drain to the storm sewer system.

3.3 SITE GEOLOGY

According to the University of the State of New York, The State Education Department *Surficial Geologic Map of New York, Niagara Sheet* (1988), the natural subsurface soils consist of lacustrine silt and clay, deposited in proglacial lakes. An alluvial deposit was encountered in the borings overlying the lacustrine material. The University of the State of New York, The State Education Department *Geologic Map of New York, Niagara Sheet* (1970) indicates that the subject site is underlain, at depth, by Upper Silurian-age Camillus, Syracuse, and Vernon Formations, consisting of shale with minor gypsum, black shale, salt, and dolostone, part of the Akron Dolostone and Salina Group.

The site is mapped by USGS as being within a karst area. Karst conditions, including solution cavities, are known to exist in areas where carbonate bedrock is present. However, given the thickness of overburden at this site and the impermeable nature of the site soils, there does not appear to be a significant risk of solution cavities or sinkholes.

3.4 PROPOSED CONSTRUCTION

Based on the aforementioned Silvestri plan, the proposed development will include the construction of a single-story addition to the existing building with a footprint of approximately 4,500 square feet and associated additional pavement, landscaping, and utilities. Whitestone anticipates that the addition will be constructed close to existing grades to match the adjacent development, which has a finished floor elevation of 577.5 feet above NAVD. No new stormwater management facilities or retaining walls are shown on the plan.

Whitestone anticipates the proposed addition will be a single-story, masonry and metal-framed structure constructed with a ground-supported concrete floor slab and no basement or crawl space. Maximum column and wall loads are expected to be on the order of:

- interior column loads - 50.0 kips;
- load bearing walls - 3.0 kips per linear foot; and
- floor slab loads - 150 pounds per square foot.

The scope of Whitestone's investigation and the professional advice contained in this report were generated based on the project details and loading noted herein. Revisions or additions to the design details enumerated in this report should be brought to the attention of Whitestone for additional evaluation as warranted.

SECTION 3.0
Subsurface Conditions

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* in Appendix A of this report. The subsurface soil conditions encountered in the test locations consisted of the following generalized strata in order of increasing depth.

4.1 SUBSURFACE SOIL CONDITIONS

Surface Cover Materials: Borings B-101, B-102, and B-103 encountered six inches of topsoil at the ground surface.

Existing Fill: Beneath the surface cover materials or at the ground surface, the borings encountered existing fill. In borings B-101 and B-102, the fill was brown to black, loose, sandy silt, trace organics. In boring B-103, the fill was black, medium stiff, silty clay with sand, trace organics over black, medium dense, organic silt with sand (possibly former topsoil). In boring B-104, the fill was black, loose, crushed stone with silt. SPT N-values recorded within the existing fill were variable, ranging from five blows per foot (bpf) to 13 bpf. The existing fill extended to depths of about two fbgs to four fbgs.

Alluvial Deposit: Beneath the existing fill, the borings encountered an alluvial deposit, consisting of an upper layer of brown to gray-brown, loose to medium dense, sandy silt (USCS: ML) or brown, very stiff, silty clay with sand (USCS: CL), underlain by brown to gray-brown, medium dense, silty sand (USCS: SM). SPT N-values recorded within the alluvial deposit were variable, ranging from seven bpf to 30 bpf. Where penetrated, the alluvial deposit extended to depths of eight fbgs to 15 fbgs. Boring B-104 terminated in the alluvial deposit at a depth of eight fbgs.

Lacustrine Deposit: Beneath the alluvial deposit, borings B-101, B-102, and B-103 encountered a lacustrine deposit, consisting of gray-brown to reddish-brown, very soft to hard, silty clay (USCS: CL). SPT N-values recorded within the lacustrine deposit were variable, ranging from weight of hammer for 24 inches of split spoon penetration to 31 bpf. The stiffer/harder clay was at the top of the stratum. Borings B-101, B-102, and B-103 terminated in the lacustrine deposit at depths of 15 fbgs to 37 fbgs.

4.2 GROUNDWATER

Groundwater was encountered within borings B-101 and B-103 during drilling at depths of 6.4 fbgs and 6.5 fbgs, respectively. Also, static and perched/trapped water conditions generally will fluctuate seasonally and following periods of precipitation.

SECTION 4.0
Conclusions and Recommendations

5.1 GENERAL

The site is underlain at depth by very soft clay soils that would consolidate and settle if site grade were raised. Whitestone anticipates that the grade of this developed site will not be raised. However, the foundation recommendation in this report is based on grade within, and in the vicinity of, the addition footprint not being raised by more than two feet.

The results of the investigation indicate that the proposed addition may be supported on conventional shallow foundations bearing on properly inspected and approved alluvial deposit or structural fill placed over the alluvial deposit. Existing fill was encountered up to a depth of four fbgs, however, deeper existing fill may be encountered during construction between the widely spaced borings. Any existing fill or organic material should be removed below footings and replaced with structural fill. Foundation subgrades should be undercut and replaced with crushed stone wrapped in geotextile separation fabric. The subgrade should be reviewed by the geotechnical engineer, as specified in this report prior to fill placement or structural support. The results of the investigation also indicate the site is suitable for a ground-supported floor slab deriving support from properly inspected and approved compacted existing fill (after removal of significant organic material) and/or compacted structural fill, as specified in this report. Additionally, the site conditions support the use of typical pavement sections using standard NYSDOT specified materials.

The fine-grained soil underlying the site is a poor draining material that will trap water beneath the pavement section, especially during the wet season and following periods of heavy precipitation. Water trapped beneath the pavement section can result in premature pavement failure due to subgrade deterioration and increased potential for heaving effects. Accordingly, Whitestone recommends installing a network of interceptor drains extending out from stormwater inlet structures to improve drainage beneath the pavement section and reduce the moisture fluctuation potential in the subgrade soils.

5.2 SITE PREPARATION & EARTHWORK

Surface Cover Stripping: Prior to stripping operations, any utilities should be identified and secured. Trees, shrubs, vegetation, topsoil, organic subsoil, and other organic matter should also be removed from within and at least five feet beyond the limits of the proposed building footprint and other site structures, as well as any other area that will require controlled structural fill placement. Tree/shrub removal should include the removal of stumps and root material. Root structures will require removal in excess of the few inches of topsoil typically encountered at the ground surface. Any buried structural elements encountered during excavations should be removed entirely. The contractor should be required to conduct earthwork in accordance with the recommendations in this report, including backfilling any excavation, etc. with structural fill. Fill or backfill placed within the proposed building area should be placed as structural fill in accordance with Section 5.2 and 5.3 of this report.

Surface Preparation/Proofrolling: Prior to placing 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 roller operated initially in static mode, with vibration added only if the soil remains firm and stable under vibratory compaction. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry weather to reduce the likelihood of degrading an otherwise stable subgrade. Fill or backfill should be placed and compacted in accordance with Section 5.3.

Weather Performance Criteria: The site soils generally have a high fines content and will soften when exposed to water. Every effort should 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 precipitation. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade materials.

Subgrade Protection and Maintenance: The site soils are moisture sensitive. Every effort should be made to minimize disturbance of the on-site materials by construction traffic and surface runoff. The on-site soils will deteriorate when subjected to repeated wetting and construction traffic and likely will require extensive drying or overexcavation and replacement. Construction schedules and budgets should account for contingencies, such as importing materials to raise grades or restore overexcavations when construction must occur following wet weather or on an expedited basis. However, if properly protected and maintained as recommended herein, the site soils will provide adequate support for the proposed construction. 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;
- regarding the site as needed to maintain positive drainage away from construction areas;
- removing wet surficial soils and ruts;
- limiting exposure to construction traffic especially following inclement weather and subgrade thawing.

Subgrade Stabilization and Inspection: Fine-grained subgrade soils which are exposed to inclement weather and heavy construction traffic will degrade and require overexcavation and replacement to provide a suitable subgrade for pavements. A tri-axial geogrid, such as Tensar TX130s or engineer approved equivalent, may be used to reduce the depth of overexcavation and stabilize pavement

subgrades. Geogrids typically are economical when proposed undercut depths exceed approximately 16 inches. The geogrid should be placed directly on the exposed subgrade and backfill should consist of a well-graded gravel and sand blend. The services of the geotechnical engineer should be retained to inspect soil conditions during construction and to provide specific recommendations for stabilizing subgrades. Additionally, a geotechnical engineer should be retained to verify the suitability of prepared foundation, floor slab and pavement subgrades for support of design loads.

5.3 STRUCTURAL FILL & BACKFILL

Imported Fill Material: Imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well-graded sand and gravel with a maximum particle size of three inches and up to 15 percent, by weight, of material finer than a #200 sieve. Imported material should be free of silt, clay, organics, and deleterious material. Imported material should be approved by a qualified geotechnical engineer prior to delivery to the site.

On-Site Material Reuse: The fine-grained soils encountered throughout the site are marginally acceptable for reuse as structural fill and/or backfill because of their difficult workability. Reuse of the fine-grained soils will likely require extensive moisture conditioning and/or drying to facilitate their reuse, workability, and compaction in fill areas. Similarly, the existing fill materials generally also have a relatively high fines content and will require drying and/or mixing with more granular material before reuse. Organic material will have to be removed from the existing fill. Reuse of the site soils will be contingent on careful review in the field by the owner's geotechnical engineer.

Stringent quality control and inspection by the geotechnical engineer will be required for suitable portions of the on-site soils to be reused as structural fill and backfill, and to check that the soils are properly placed and compacted within two percent of their optimum moisture content.

Immediate re-use of on-site soils for structural fill or backfill should not be anticipated as the majority of the site natural soils are moisture sensitive. On-site natural materials that are or become wet will require extensive handling, such as discing and aerating, which may not be practical during wet seasons or where site area is limited. In order to attempt the re-use of on-site soil, the contractor should cover stockpiled soils, seal subgrades each day with a smooth drum roller, and provide proper surface drainage during forecasted wet weather. Alternatively, imported fill materials may be required to expedite earthwork operations. The stripped surface cover materials should not be used as structural fill or backfill.

Submerged Fill: In the wet (flooding, perched water, or groundwater), consideration should be given to placing an open-graded, 0.75-inch crushed stone to provide a working mat, expedite dewatering efforts and enable subsequent placement of structural fill or backfill in the dry. Prior to placing submerged fill materials, free water and disturbed materials should be removed to the extent recommended by the geotechnical engineer. A fines barrier geotextile, such as Mirafi 140N or equivalent, should be placed at the base and sides of the overexcavation to separate the crushed stone from underlying and adjacent soils. The fabric also should be placed on top of the crushed stone prior to subsequent fill placement, if fill soils with a substantial amount of fines are to be used to restore grade.

Compaction and Placement Requirements: Fill and backfill should be placed in maximum eight-inch thick loose lifts and compacted using a vibratory drum roller during mass grading activities or a small hand-held vibratory compactor within excavations. A sheepsfoot roller may be appropriate if fine-grained material is used as fill. Structural fill and backfill should be compacted to at least 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

Structural Fill Testing: A sample of the imported fill material or on-site material proposed for reuse as structural fill or backfill should be submitted to the owner's geotechnical engineer for analysis and approval at least one week prior to its use. The placement of fill and backfill should be monitored by a qualified engineering technician, so that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests should be conducted, so that the specified compaction is achieved throughout the height of the fill or backfill.

5.4 GROUNDWATER CONTROL

Static groundwater was encountered within two borings during this investigation at a depth of approximately 6.5 fbgs. However, shallower perched/trapped water may be encountered during construction above non-permeable strata, such as at the interface between existing fill and the natural site soils. As such, construction phase dewatering will likely consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that construction phase dewatering would include installing temporary sump pits and filtered pumps within trenches and excavations.

Proper grading and drainage should be incorporated into the site design and construction phase grading to discourage ponding of surface runoff. Every effort should be made to maintain drainage of surface run-off away from construction areas by grading. The contractor should limit exposure of excavations and prepared subgrades to rainfall. Overexcavation of wet soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

5.5 FOUNDATIONS

Shallow Foundation Design Criteria: The results of the investigation and engineering analyses indicated that the proposed addition may be supported on conventional shallow foundations bearing on the alluvial deposit, or structural fill placed over the alluvial deposit. Existing fill was encountered up to a depth of four fbgs, however, deeper existing fill may be encountered during construction between the widely spaced borings. Any existing fill or organic material below footings should be removed and replaced with structural fill. Foundation subgrades should be undercut by at least eight inches and replaced with minus 0.75-inch crushed stone wrapped in geotextile separation fabric (Mirafi 140N, or similar). Foundations bearing on suitably prepared subgrades may be designed to impart a maximum allowable net bearing pressure of 3,000 pounds per square foot. Regardless of loading conditions, new foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Foundation subgrades should be compacted with a roller operated in static mode in the presence of the geotechnical engineer to densify any disturbed soils. The fine-grained soils are susceptible to disturbance by vibrations from compaction equipment and other construction activity. Compaction should therefore only be attempted under the direction of the geotechnical engineer, such that the underlying fine-grained materials do not become disturbed by the compaction process. A smooth bladed bucket would be appropriate for excavation of the fine-grained materials. Consideration should be given to the option of placing geotextile separation fabric and a few inches of crushed stone over the fine-grained soil exposed in the bottom of foundation excavations to reduce the likelihood of disturbance and provide a working surface for formwork and reinforcing steel placement.

Footings should be designed such that the maximum toe pressure due to the combined effect of vertical loads (including soil weight) and overturning moment does not exceed the recommended maximum allowable 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 footing. Side friction should be neglected when proportioning the footings; lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction (ultimate) against sliding of 0.3 is recommended for use in the design of the foundations bearing within the site soils or imported structural fill.

Foundation Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils along new footing bottoms be reviewed by a geotechnical engineer prior to placing concrete for the footings. Special attention should be given to areas of the site underlain by soft/loose conditions. In the event that isolated areas of unsuitable materials are encountered in footing excavations, additional overexcavation and replacement of the materials or deeper foundation embedment may be necessary to provide a suitable footing subgrade. 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 grade is restored with lean concrete.

Settlement: Whitestone estimates post construction settlements of new building foundations will be on the order of less than one inch, if the recommendations outlined in this report are properly implemented. Differential settlements of new building foundations should be less than about one half inch.

Frost Coverage: Footings subject to frost action should be placed at least 48 inches below adjacent exterior grades, or the depth required by local building codes, to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the slab subgrade, but should not be placed on the existing fill.

5.6 FLOOR SLAB

Whitestone anticipates that the properly inspected and approved existing fill (after thorough surface compaction and removal of significant organic material) and/or compacted structural fill will be suitable for support of the proposed floor slab at grade, provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions. Unsuitable materials, including any buried topsoil/organics, and areas that are, or become, softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum 12-inch thick layer of NYSDOT 733-04 Subbase Course, Type 2 (or approved equivalent) should be placed over the structural fill below the floor slab to provide a uniform subbase. If the floor supports moisture-sensitive covering or equipment, a moisture vapor barrier should also be installed beneath the floor slab in accordance with flooring manufacturer's recommendations.

5.7 PAVEMENT DESIGN CRITERIA

General: Whitestone anticipates that the properly inspected and approved existing fill (after thorough surface compaction) and/or compacted structural fill/backfill placed to raise or restore design elevations will be suitable for support of the proposed pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions.

Design Criteria: A California Bearing Ratio value of 5.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 15,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement Sections: Pavement components should meet material specifications from NYSDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (inches)**	**Heavy-Duty Thickness (inches)**
Asphalt Top Course	NYSDOT 12.5 mm F3 Top Course HMA, 70 Series Compaction (Superpave); PG64S-22	1.5	1.5
Asphalt Binder Course	NYSDOT 19 mm F9 Binder Course HMA, 70 Series Compaction (Superpave); PG64S-22	1.5	2.5
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0	12.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at the trash enclosure, service access lanes, and ingress/egress locations. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi air-entrained concrete	6.0 [1]
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0

[1] The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

Pavement Drainage Systems: Whitestone recommends installing a network of interceptor drains extending from stormwater inlet structures to improve drainage within proposed pavement areas. Radial interceptor drains typically consist of top perforated polyvinyl chloride (PVC) piping within a 12-inch by 12-inch, clean 0.75-inch crushed stone layer surrounded by a fines separation fabric. A woven fabric, such as long-term clog resistant Mirafi FW700, or approved equivalent, is recommended. The interceptor drains should be designed to pitch towards and discharge into the stormwater drainage system. The pipes should have a minimum slope of 0.5 percent.

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with Sections 5.2, 5.3, and 5.11 of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control, as well as measures to drain water from the subgrade, such as inceptor drains connecting to inlets.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NYSDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete

material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

5.8 RETAINING WALLS/LATERAL EARTH PRESSURES

Proposed site retaining walls were not indicated at this time. Whitestone should be notified if retaining walls or structures resisting lateral earth pressures are planned. The following parameters may be used for preliminary design of any below-grade walls, retaining walls, and other structures reliant on granular materials to provide adequate drainage. However, the parameters are not directly applicable to the design of mechanically stabilized earth (MSE) retaining walls, which require proprietary design methods for the selected earth retention system.

Lateral Earth Pressures: Retaining/below-grade walls should be capable of withstanding active and at-rest earth pressures. Backfill soils adjacent to these structures should consist of freely draining granular fill composed primarily of coarse to fine sand. Clay and silt soils, such as the majority of the site soils, should not be used as retaining wall backfill. With an active earth pressure coefficient (K_a) of 0.33, level backfill, and an assumed maximum backfill soil unit weight of 140 pounds per cubic foot (pcf), an equivalent fluid pressure of 46 psf per foot of wall height should be used in design of retaining/below-grade walls which are free to rotate.

Retaining/below-grade walls and wall corners typically are restrained from lateral movement and should be designed using at-rest earth pressures. A coefficient of at-rest earth pressure (K_o) of 0.5, for a level backfill, is recommended for retaining/below-grade walls designed to resist at-rest earth pressures, which assume no lateral movement. With an assumed maximum total unit weight of backfill of approximately 140 pcf, an equivalent fluid pressure of 70 pounds per square foot per foot of wall height should be used in design of restrained retaining/below-grade wall and wall corners. A coefficient of friction of 0.3 against sliding can be used for concrete on the existing site soils. Additional lateral earth pressures from a sloped backfill or any temporary or long term surcharge loads also should be included in the design. Retaining wall design should include a global stability analysis.

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind 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 up to 15 percent of material finer than a #200 U.S. Standard sieve.

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.

Wall Drainage: Positive drainage should be provided at the base of the below-grade walls. Where wall drainage is not provided, the wall should be designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

5.9 SEISMIC & LIQUEFACTION CONSIDERATIONS

The subsurface conditions are most consistent with a Site Class D, as defined by the *New York State Building Code*. Based on the type of building (single story), seismic zone, and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

5.10 EXCAVATIONS

The site soils encountered during this investigation typically are, at a minimum, consistent with Type C Soil Conditions, as defined by 29 CFR Part 1926 (OSHA), which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented.

Care should be taken when excavating close to the footings of the existing building. Excavations should not undermine or otherwise disturb the existing foundations. As a guide, excavation should not be conducted within a slope of 1:1 (horizontal to vertical) out and down from the outside edge of the existing footings. If excavation is required within this zone, the existing foundation should be underpinned. In addition, depending on the configuration of the existing footings and foundation walls with respect to any excavations, lateral support may also have to be provided until the new structure is in place and the areas are backfilled.

5.11 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The overexcavation of unsuitable soil and proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

SECTION 5.0
General Comments

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structure. Soil bearing conditions should be checked at the appropriate time for consistency with those conditions encountered during Whitestone's geotechnical investigation.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards, which may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the sole use of Frank P. Langley Co., Inc. for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

The possibility exists that conditions between borings may differ from those at specific test locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may alter soil and rock conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered.

Whitestone assumes that a qualified contractor will be employed to conduct the construction work, and that the contractor will be required to exercise care to ensure excavations are conducted in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

Whitestone recommends that the services of the geotechnical engineer be engaged to test and evaluate the soils in the footing excavations prior to concreting in order to determine that the soils will support the bearing pressures. Monitoring and testing also should be conducted to check that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade soils.

The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the design details furnished by Frank P. Langley Co., Inc. and Silvestri Architects, PC. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties, express or implied, are made.

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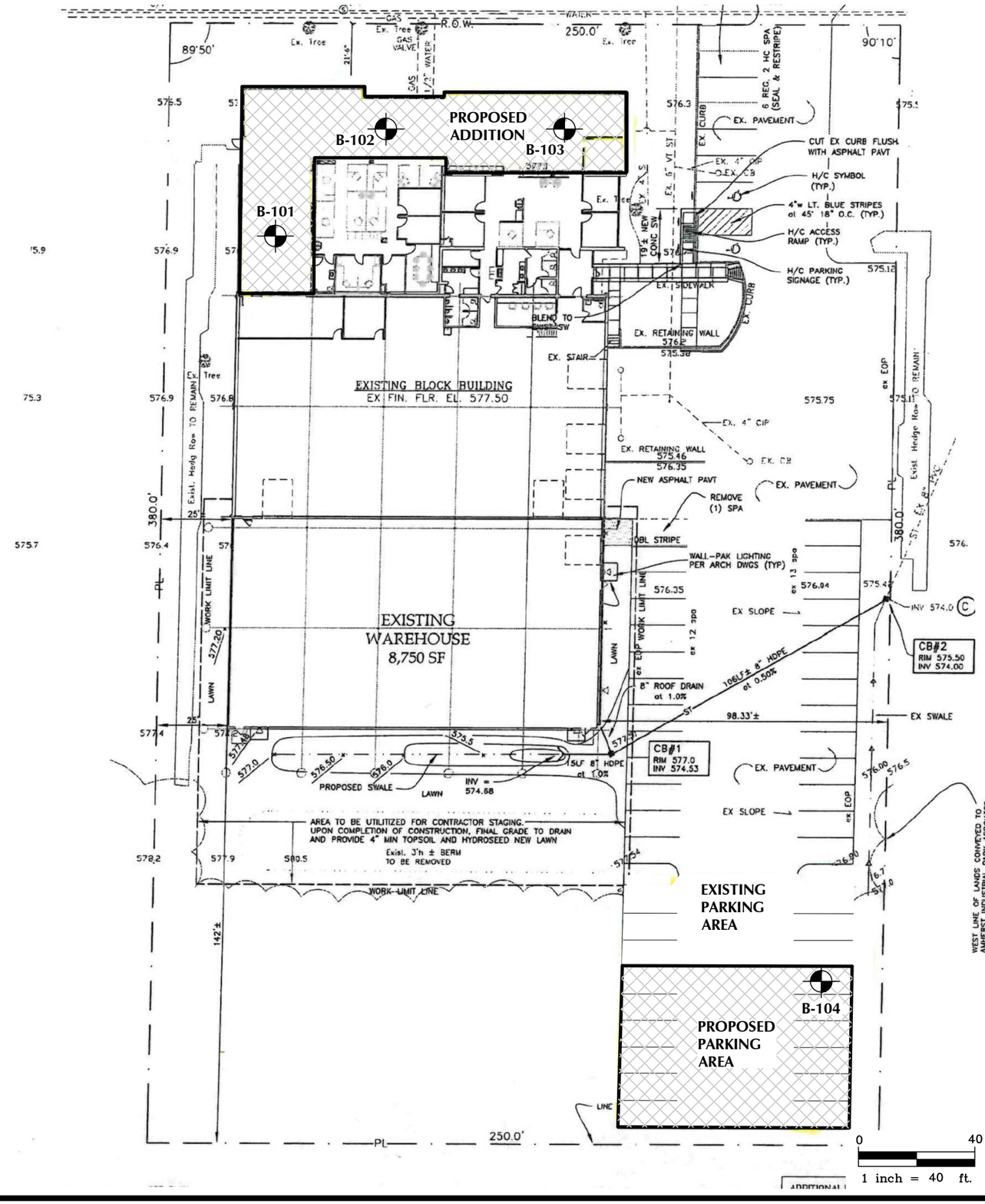
FIGURE 1
Boring Location Plan



LEGEND

BORING LOCATION

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON A 8/11/05 (REVISED) SITE LAYOUT, GRADING DRAINAGE & UTILITY PLAN & DETAILS PLAN, PREPARED BY SILVESTRI ARCHITECTS PC.

WHITESTONE
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DRAWING TITLE: **BORING LOCATION PLAN**

CLIENT: **FRANK P. LANGLEY CO., INC.**

PROJECT: **PROPOSED BUILDING ADDITION**
219 CREEKSIDE DRIVE
AMHERST, ERIE COUNTY, NEW YORK

PROJECT #: GR2421508.Y00	
DESIGNED BY: MR	PROJ. MGR.: CG
DATE: 3/18/24	FIGURE: 1
SCALE: 1" = 40'	

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WHITESTONE

APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-101

Project:	Proposed Building Addition	**WAI Project No.:**	GR2421508.Y00
Location:	219 Creekside Drive, Amherst, Erie County, New York	**Client:**	Frank P. Langley Co., Inc.
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	2/22/2024
Termination Depth:	15.0 feet bgs	**Date Completed:**	2/22/2024
Proposed Location:	Building Addition	**Logged By:**	FM
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE
		Equipment:	CME 550X

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	6.4 | --	**At Completion:**	-- | --
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				
							TS		6" Topsoil	
0 - 2	S-1	X	1 - 3 - 5 - 6	6	8		EXISTING FILL		Brown to Black, Loose, Sandy Silt, Trace Organics (FILL)	
						2.0				
2 - 4	S-2	X	5 - 6 - 9 - 10	15	15				Brown, Medium Dense, Sandy Silt (ML)	
4 - 6	S-3	X	4 - 4 - 7 - 7	14	11	5.0			As Above (ML)	
6 - 8	S-4	X	4 - 5 - 7 - 10	22	12		ALLUVIAL DEPOSIT		Brown, Medium Dense, Silty Sand (SM)	
8 - 10	S-5	X	5 - 7 - 6 - 6	18	13				As Above (SM)	
						10.0				
10 - 12	S-6	X	5 - 9 - 11 - 14	12	20	11.0			As Above (SM)	
									Gray-Brown, Very Stiff, Silty Clay (CL)	
							LACUSTRINE DEPOSIT			
13 - 15	S-7	X	14 - 14 - 17 - 19	15	31				As Above, Hard (CL)	
						15.0				
									Boring Log B-101 Terminated at Depth of 15.0 feet below ground surface.	
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-102

Project:	Proposed Building Addition	**WAI Project No.:**	GR2421508.Y00
Location:	219 Creekside Drive, Amherst, Erie County, New York	**Client:**	Frank P. Langley Co., Inc.
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	2/22/2024
Termination Depth:	37.0 feet bgs	**Date Completed:**	2/22/2024
Proposed Location:	Building Addition	**Logged By:**	FM
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE
		Equipment:	CME 550X

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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				
							TS		6" Topsoil	
0 - 2	S-1		WOH - 2 - 4 - 5	9	6		EXISTING FILL		Black, Loose, Sandy Silt, Trace Organics (FILL)	
						2.0				
2 - 4	S-2		9 - 9 - 11 - 11	22	20				Brown, Very Stiff, Silty Clay with Sand (CL)	w/c = 15.5%
4 - 6	S-3		4 - 5 - 6 - 7	20	11	5.0			Brown, Medium Dense, Silty Sand (SM)	w/c = 21.5%
6 - 8	S-4		12 - 14 - 14 - 17	16	28				As Above (SM)	w/c = 17.5%
8 - 10	S-5		8 - 9 - 9 - 6	17	18		ALLUVIAL DEPOSIT		As Above, Gray-Brown (SM)	w/c = 18.9%
						10.0				
10 - 12	S-6		9 - 12 - 17 - 17	22	29				As Above (SM)	w/c = 17.4%
						15.0				
15 - 17	S-7		1 - 1 - 1 - 1	20	2				Reddish-Brown, Very Soft to Soft, Silty Clay (CL)	w/c = 41.5%
						20.0				
20 - 22	S-8		WOH/24"	22	-		LACUSTRINE DEPOSIT		As Above, Very Soft (CL)	w/c = 50.0%
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-102

Project:	Proposed Building Addition	**WAI Project No.:**	GR2421508.Y00
Location:	219 Creekside Drive, Amherst, Erie County, New York	**Client:**	Frank P. Langley Co., Inc.
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	2/22/2024
Termination Depth:	37.0 feet bgs	**Date Completed:**	2/22/2024
Proposed Location:	Building Addition	**Logged By:**	FM
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE
		Equipment:	CME 550X

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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				
25 - 27	S-9	X	WOH/24"	22	-				Reddish-Brown, Very Soft, Silty Clay (CL)	w/c = 46.7%
						30.0				
30 - 32	S-10	X	WOH/18" - 2	22	-		LACUSTRINE DEPOSIT		As Above (CL)	w/c = 45.5%
						35.0				
35 - 37	S-11	X	WOH /12" - 1 - 2	22	1				As Above (CL)	w/c = 41.1%
						40.0			Boring Log B-102 Terminated at Depth of 37.0 feet below ground surface.	
						45.0				
						50.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-103

Page 1 of 1

Project:	Proposed Building Addition	**WAI Project No.:**	GR2421508.Y00
Location:	219 Creekside Drive, Amherst, Erie County, New York	**Client:**	Frank P. Langley Co., Inc.

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	2/23/2024		
Termination Depth:	20.0 feet bgs	**Date Completed:**	2/23/2024		
Proposed Location:	Building Addition	**Logged By:**	FM	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** 6.5 | --	**At Completion:** -- | --
		Equipment:	CME 550X	**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				
							TS		6" Topsoil	
0 - 2	S-1		1 - 2 - 5 - 6	5	7		EXISTING FILL		Black, Medium Stiff, Silty Clay with Sand, Trace Organics (FILL)	
2 - 4	S-2		6 - 6 - 7 - 9	6	13	4.0			Black, Medium Dense, Organic Silt with Sand (FILL)	
4 - 6	S-3		3 - 3 - 4 - 3	8	7	5.0	ALLUVIAL DEPOSIT		Brown, Loose, Sandy Silt (ML)	
6 - 8	S-4		4 - 6 - 10 - 10	13	16	8.0			Gray-Brown, Medium Dense, Silty Sand (SM)	
8 - 10	S-5		4 - 5 - 9 - 15	12	14	10.0	LACUSTRINE DEPOSIT		Gray-Brown, Stiff, Silty Clay (CL)	w/c = 25.5%
10 - 12	S-6		3 - 9 - 5 - 15	20	14				As Above (CL)	
12 - 14	S-7		12 - 12 - 16 - 17	15	28				As Above, Very Stiff (CL)	w/c = 26.5%
14 - 16	S-8		2 - 2 - 1 - 2	24	3	15.0			As Above, Reddish-Brown, Soft (CL)	w/c = 35.0%
16 - 18	S-9		WOH/18" - 1	24	-				As Above, Very Soft (CL)	
18 - 20	S-10		WOH /12" - 1 - 2	24	1	20.0			As Above (CL)	
						25.0			Boring Log B-103 Terminated at Depth of 20.0 feet below ground surface.	

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-104

Page 1 of 1

Project:	Proposed Building Addition	**WAI Project No.:**	GR2421508.Y00
Location:	219 Creekside Drive, Amherst, Erie County, New York	**Client:**	Frank P. Langley Co., Inc.
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	2/23/2024
Termination Depth:	8.0 feet bgs	**Date Completed:**	2/23/2024
Proposed Location:	Parking	**Logged By:**	FM
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE
		Equipment:	CME 550X

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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	X	3 - 4 - 1 - 3	5	5		EXISTING FILL		Black, Loose, Crushed Stone with Silt (FILL)	
						2.0				
2 - 4	S-2	X	4 - 5 - 9 - 9	4	14		ALLUVIAL DEPOSIT		Gray-Brown, Medium Dense, Sandy Silt (ML)	
4 - 6	S-3	X	9 - 5 - 7 - 8	13	12	5.0			As Above (ML)	
6 - 8	S-4	X	4 - 11 - 19 - 15	11	30				Brown, Medium Dense to Dense, Silty Sand (SM)	
									Boring Log B-104 Terminated at Depth of 8.0 feet below ground surface.	
						10.0				
						15.0				
						20.0				
						25.0				

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

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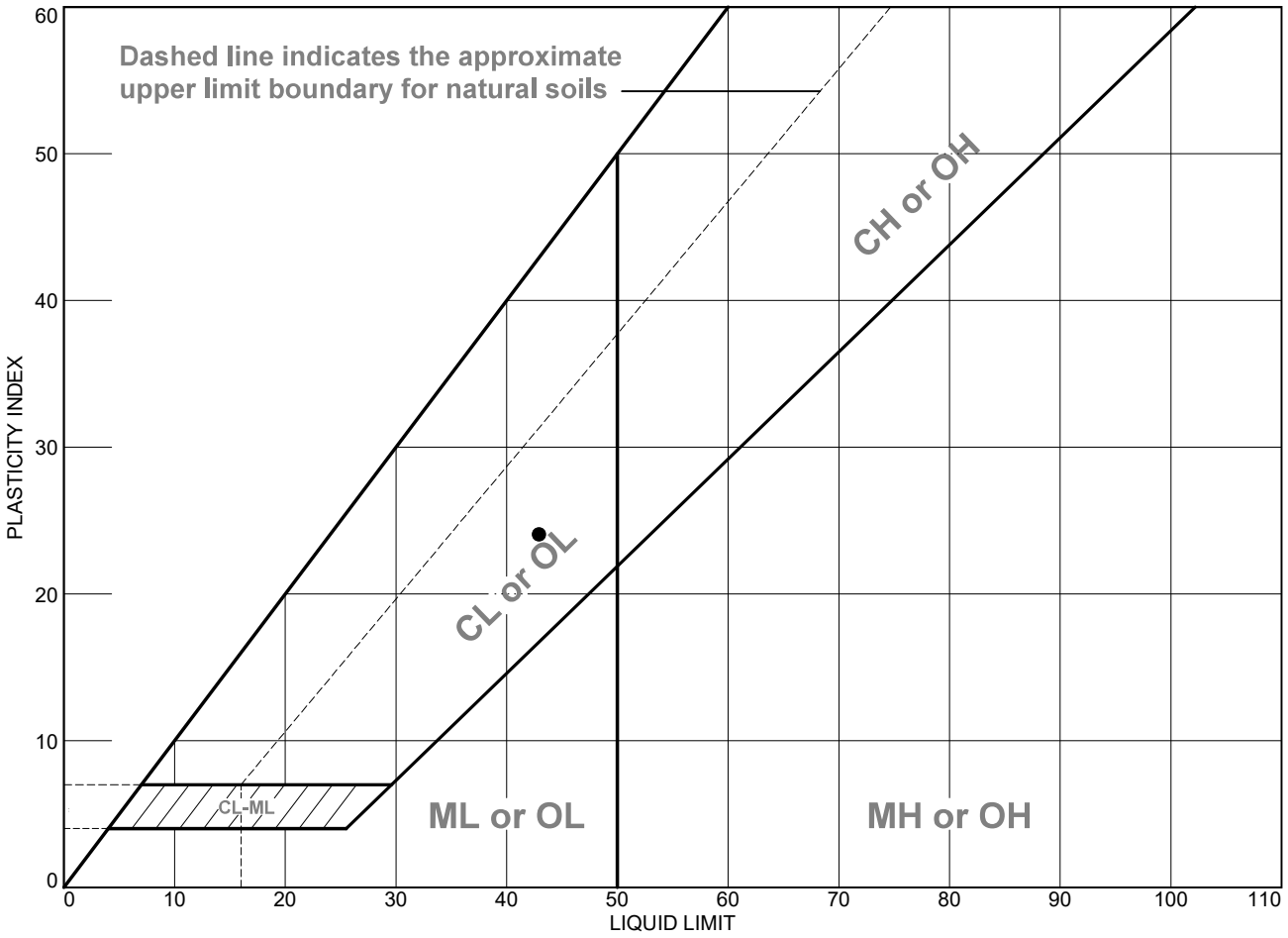
APPENDIX B
Laboratory Test Results

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty Clay	43	19	24			CL

Project No. GR2421508.Y00 **Client:** Frank P. Langley Co., Inc.

Project: Proposed Building Addition

219 Creekside Drive, Amherst, Erie County, New York

●**Source of Sample:** B-102 **Depth:** 15.0' - 17.0'

Remarks:

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Figure: S-1

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APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE

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UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	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 - Rochester.docx

WHITESTONE

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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		