Report of Geotechnical Engineering Exploration

WESTGATE WWTP
CRANE, INDIANA
24-0293-01G

Prepared For:
Nicholas Murphy
American Structurepoint, Inc.
9025 River Road, Suite 200
Indianapolis, Indiana 46240

Patriot Engineering and Environmental, Inc.
6150 East 75th Street
Indianapolis, Indiana 46250

July 19, 2024

PATRIOT
ENGINEERING AND ENVIRONMENTAL, INC.

July 19, 2024

Mr. Nicholas Murphy
American Structurepoint, Inc.
9025 River Road, Suite 200
Indianapolis, Indiana 46240

Re: Report of Geotechnical Engineering Exploration
Westgate WWTP
County Road 800 South
Crane, Indiana
Patriot Project No. 24-0293-01G

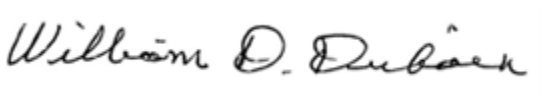
Dear Nicholas:

Attached is the report of our subsurface exploration for the above referenced project. This exploration was completed in general accordance with our Proposal No. P23-1620-01G dated August 23, 2023.

We appreciate the opportunity to perform this geotechnical engineering exploration and are looking forward to working with you during the construction phase of the project. If you have questions regarding this report or if we may be of additional assistance regarding any geotechnical aspect of the project, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.

Akshat Saxena, PE
Project Engineer



William D. Dubois, PE
Senior Principal Engineer

6150 East 75th Street, Indianapolis, Indiana 46250
Ph. 317-576-8058 • Fax 317-576-1965 • Web www.patrioteng.com
INDIANA - Bloomington, Evansville, Fort Wayne, Indianapolis, Lafayette, Terre Haute
KENTUCKY - Louisville, OHIO - Cincinnati, Dayton

TABLE OF CONTENTS

APPENDICES

REPORT OF GEOTECHNICAL ENGINEERING EXPLORATION

WESTGATE WWTP
CRANE, INDIANA
24-0293-01G

1.0 INTRODUCTION

1.1 General

American Structurepoint, Inc. is planning the construction of new wastewater treatment plant (WWTP) to be located along County Road 800 South in Crane, Indiana. The results of our geotechnical engineering exploration are presented in this report.

The results of our geotechnical engineering exploration for the water main alignment were issued in the Geotech report dated July 11, 2024 under the same project number.

1.2 Purpose and Scope

The purpose of this exploration is to determine the general near surface and subsurface conditions within the project area and to develop the geotechnical engineering recommendations necessary for the design and construction of the proposed wastewater treatment structures. This was achieved by drilling soil borings, and by conducting laboratory tests on samples taken from the borings. This report contains the results of our findings, an engineering interpretation of these results with respect to the available project information, and recommendations to aid in the design and construction of the proposed plant.

2.0 PROJECT INFORMATION

The proposed project is located south of County Road 800 South, at the end Captain W. J. Nelson Drive, in Crane, Indiana. The project includes construction of a WWTP, a force main, and a lift station at the site. The WWTP will include an anaerobic tank, an orbal oxidation ditch, clarifiers, a post aeration tank, a scum pump station, liquid sludge storage tanks, an office building, a headworks building, a prefab chemical storage building, various pump stations, and other associated structures and systems. Reportedly, a few of these structures and systems have also been proposed in future phases. We understand that the force main will be a 12-inch Standard Dimension Ratio (SDR) 26 PVC pipe.

Loading details were not available at the time of this report. Based on our experience with similar projects, we estimate that the proposed structures at-grade (like tanks, buildings, etc) will have wall loads not exceeding 2,000 pounds per lineal feet (plf), isolated column loads not exceeding 50 kips, and that floor loads will not exceed 150 pounds per square foot (psf). We also understand that the structures bearing at deeper depths (like pump stations, lift station, clarifiers, oxidation ditches, etc) will have wall loads not exceeding 10,000 plf and isolated column loads not exceeding 200 kips. Additionally, based on the provided grading plan, the maximum cut and fill depths will be about 8 feet (near the clarifiers) and 9 feet (near the auger screen channel), respectively.

The above narrative is based upon information provided to *Patriot*. This represents the most current information available at the time of issuance of this report. Our assumptions and the recommendations set forth in this report are therefore directly related to this information. *Patriot* should be notified immediately if the provided information provided to us changes during the design development. We cannot be responsible if changes are made to the project, and we are not allowed to determine if our recommendations remain valid.

3.0 EXPLORATIONAL PROCEDURES

3.1 Field Work

A total of fourteen (14) soil borings were drilled, sampled, and tested at the project site between May 2 and May 7, 2024, at the approximate locations shown on the Soil Boring Location Map in Appendix A. All depths are given as feet below the existing ground surface. Boring locations and depths were provided by the *Client*. It should be noted that borings B-1 through B-4 were performed for the new force main alignment and B-5 through B-14 were drilled within the proposed WWTP footprint.

The borings were advanced using 3¼" I.D. (inside diameter) hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique in accordance with ASTM D 1586-74. A 2" O.D. (outside diameter) by 1 3/8" I.D. split-spoon sampler was driven a total of 18 inches with the number of blows of a 140-pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the N-value (or blow-count). Where the Split-spoon sampler is advanced less than 6 inches in 50 blows, it is indicated as: 50 / (number of inches advanced per 6-inch interval). Split-spoon samples were recovered at 2.5-feet intervals, beginning at a depth of 1 foot below the existing surface grade, extending to a depth of 10 feet, and at 5-feet intervals thereafter to the termination of the boring. Water levels were monitored at each borehole location during drilling and upon completion of the boring. The boreholes were backfilled with auger cuttings prior to demobilization.

Upon completion of the boring program, the samples retrieved during drilling were returned to *Patriot*'s soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and our visual examination. Test boring logs and a description of the classification system are included in Appendix A in this report. Indicated on each log are the primary strata encountered, the depth of each stratum change, the depth of each sample, the Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

3.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analyses included natural moisture content determinations (ASTM D 2216), unconfined compressive strength testing on cohesive soils (ASTM D 2166), and an estimate of the cohesive soil strength was determined by utilizing a hand penetrometer (qp). The results of all laboratory tests are summarized in Section 4.2 and are shown on the boring logs and laboratory data sheets as appropriate.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Alignment Conditions

The project site is presently farmland surrounded by similar agricultural-use land and commercial establishments. The topography in the area proposed for WWTP construction gently slopes from down from elevation of 617 feet (in the southwestern portion) to 607 feet (in the northeastern portion).

4.2 Subsurface Conditions

Our interpretation of the subsurface conditions is based upon widely spaced soil borings drilled at the approximate locations shown on the Boring Location Map in Appendix A. The following discussion is general; for more specific information, please refer to the boring logs presented in Appendix A. The dashed stratification lines shown on the soil boring logs indicate approximate transitions between soil types. In situ stratification changes could occur gradually or at different depths. All depths discussed below refer to depths below the existing ground surface.

Topsoil – Topsoil, a surficial layer of material that is a blend of silts, sands, and clays, with varying amounts of organic matter, was observed in every boring at ground surface and the thickness ranged between 1 and 13 inches.

Native Cohesive Soils (CL) – Native cohesive soils observed within our borings were classified as very soft to hard sandy and silty clays. Standard Penetration Test N-values (blow counts) in this material varied from 2 to 46 blows per foot (bpf). Very soft and soft clayey soils (indicating yielding/compressible soils) were encountered in borings B-1 and B-13 below the topsoil and at 18.5 feet, respectively. The native clayey materials have moisture contents ranging from 8 to 31 %. Refer to Table 1 for very soft and soft clayey soils depths and Table 2 for unconfined compressive strength testing results.

Native Granular Soils (SP-SM, SC, and SM) – Native granular soils encountered within our borings were classified as very loose to medium dense sands, clayey sands, and silty sands. Standard Penetration Test N-values in this material varied from 2 to 30 bpf. Very loose granular soils were observed in B-2 and B-3 at 8.5 and 13.5 feet, respectively. Refer to Table 1 for very loose granular soils depths.

Sandstone - Highly weathered sandstone was encountered underlying the overburden soils in B-7 and B-9 through B -12 at depths ranging from 18.5 and 28.5 feet. Refer to Table 3 for sandstone depths.

Table 1. Depth to very soft and soft cohesive soils and very loose granular soils.

Boring No.	Description	Depth (feet)
Cohesive Soils		
B-1	Very soft silty clay	0-3.5
B-13	Soft silty clay	18.5-23.5
Granular Soils		
B-2	Very loose sand	8.5-18.5
B-3	Very loose sand	13.5-18.5

Table 2. Unconfined compressive strength testing results

Boring No.	Depth (feet)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Unconfined Compressive Strength
B-1	3-5	131.2	109.9	1.6
B-2/2A	3-5	133.5	115.7	1.1
B-3	3-5	130.9	110.6	1.0
B-4	3-5	130.4	112.2	0.8
B-6/6A	6-8	131.4	112.2	1.6
B-7	6-8	128.7	108.8	1.8
B-9/9A	6-8	132.9	112.9	1.0
B-11	6-8	126.5	105.9	1.6
B-12	6-8	127.5	102.5	1.0
B-14	6-8	130.3	108.5	1.3

Table 3. Depth to sandstone

Boring No.	Depth (feet)
B-7	18.5
B-9	28.5
B-10	23.5
B-11	18.5
B-12	18.5

4.3 Groundwater Conditions

Groundwater was observed in six (6) borings during drilling and in three (3) borings on completion above the cave-in depths when augers were removed from the boreholes. Refer to Table 4 for groundwater depths.

Table 4. Groundwater depths

Boring No.	Groundwater depth during drilling (feet)	Groundwater depth at completion (feet)
B-1	8.5	Dry
B-2	8.5	13
B-3	8	10
B-4	18.5	Dry
B-12	13.5	12
B-13	18.5	Dry

The term groundwater pertains to any water that percolates through the soil found on site. This includes any overland flow that permeates through a given depth of soil, perched water, and water that occurs below the “water table”, a zone that remains saturated and water-bearing year-round.

It should be recognized that fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. ***The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the installation of which was beyond the scope of this exploration.***

5.0 DESIGN RECOMMENDATIONS

5.1 Basis

Our recommendations are based on data presented in this report, which include soil borings, laboratory testing and our experience with similar projects. Subsurface variations that may not be indicated by a dispersive exploratory boring program can exist on any site. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected.

5.2 Foundations for At-Grade Structures

The proposed at-grade structures (like tanks, buildings, etc) can be supported on shallow footings (continuous wall footings and isolated column pads) bearing on at least medium stiff native soils, loose granular soils, or new compacted and tested fill. The footings may be designed for a maximum net allowable bearing pressure of 2,500 pounds per square foot (psf), full dead and full live load for isolated footings and 2,000 psf for continuous footings. Furthermore, we recommend that each footing subgrade be visually inspected by a *Patriot* representative following the excavation of the footing area. In addition, each foundation area should be probed using a dynamic cone penetrometer (DCP) to a depth of 5 feet below the footing subgrade. This is to ensure that the underlying soil has an SPT blow count of 7 or more. Inspection and probing should be performed at multiple locations within each isolated footing subgrade and at every 10 feet along strip footing subgrades.

All exterior foundations and foundations in unheated areas should be located at a depth of at least 30 inches below final exterior grade for frost protection. Additionally, interior foundations in heated areas can bear at depths of approximately 24 inches below the finished floor. We recommend that wall (strip) footings be at least 18 inches wide and column footings be at least 24 inches wide for bearing capacity considerations.

Care must be taken during the foundation excavation to not disturb the foundation soils and create an unstable condition. It is strongly recommended that Patriot be retained to review the soil conditions at the founding level to verify that the soils are similar to those encountered in the soil test borings and the founding material is stable and capable of supporting the intended loading.

For proper performance at the recommended bearing pressure, foundations must be constructed in compliance with the recommendations for footing excavation observation that are discussed in the Construction Considerations section of this report. It may be necessary to undercut the excavation at isolated locations to accommodate the design bearing capacity. Careful field control during construction by *Patriot* will be necessary to confirm that the exposed material is capable of supporting the design bearing pressure and minimize the post construction settlement potential.

In using the above net allowable soil bearing pressures, the weight of the foundation and backfill over the foundation need not be considered. Hence, only loads applied at or above the minimum finished grade adjacent to the footing need to be used for dimensioning the foundations. Each new foundation should be positioned so it does not induce significant pressure on adjacent foundations; otherwise, the stress overlap must be considered in the design.

Water should not be allowed to collect on top of either bearing strata within footing excavations, or around completed footings, to mitigate any potential softening or swelling problems. Positive drainage of surface water, including downspout discharge, should be maintained away from structure foundations to avoid wetting and weakening of the foundation soils both during construction and after construction is complete.

5.3 Foundations For Below-Grade Structures

The proposed below-grade structures (like pump stations, lift station, clarifiers, oxidation ditches, etc) can be supported on mat foundations bearing within medium stiff native cohesive soils, loose granular soils, new compacted and tested fill. It is anticipated that these structures could be up to 16 feet below proposed grades. Mat foundations bearing within these soils should be proportioned using a net allowable soil bearing pressure not exceeding 2,500 pounds per square foot (psf).

For structures supported on mat foundations bearing on natural stiff to very stiff clays or on newly well-compacted structural fills, a modulus of subgrade reaction (Kv1) of 100 pounds per cubic inch (pci) should be used. Other details including treatment of unsuitable foundation soils and observation of foundation excavations as outlined in this report are applicable for the design and construction of a mat foundation at the site.

The subgrade modulus (Kv) for the mat is affected by the size of the mat foundation and would vary according to the following equation:

$$Kv = Kv1 \times (B+1)^2 / 4B^2$$

Where: Kv1 is the modulus of vertical subgrade reaction

B is the width of the mat foundation.

Thus, for a footing width of B = 20 ft. bearing on the suitably prepared subgrade soils, the subgrade modulus would be:

$$Kv = 100 \times (20+1)^2 / (4 \times 20^2) = 27.6 \text{ pci}$$

We recommend limiting construction traffic on the subgrade and installing a 12-inch working mat consisting of open graded gravel or crushed stone as a base course for construction if the subgrade conditions begin to deteriorate with continued construction vehicle traffic or if the subgrade area is saturated. Concrete should not be placed on disturbed soils or in an excavation that contains standing water. Disturbed soils or soft soils should be replaced or compacted and tested prior to the placement of footing forms and reinforcing steel.

For proper performance at the recommended design bearing pressure, foundations must be constructed in compliance with the recommendations for footing excavation inspection that are discussed in Section 6.0 “Construction Considerations”. We estimate that the total foundation settlement for these mats should not exceed approximately 1 to 2 inches depending on the loading and foundation configuration. Careful field control during construction is necessary to minimize the actual settlement that will occur.

5.4 Floor Slabs

5.4.1 Slab-on-grade

In general, the shallow soils below the topsoil are suitable for floor slab support. However, soft/inconsistent/yielding/loose soils may need to be conditioned prior to placing the granular base course. We recommend that these soils be completely removed within the building pad area and replaced with new compacted and tested structural fill. If soft, compressible, and inconsistent soils are observed during the proofrolling then it may be necessary to undercut to stiffer/denser soils and then backfill with new compacted and tested structural fill.

5.4.2 Below-grade Floor Slabs

Pump stations, lift station, clarifiers, oxidation ditches, etc. are anticipated to have below-grade slabs. The deeper soils generally consist of medium stiff to hard clays or medium dense sands, which if properly prepared are suitable for floor slab support. However, if soft/inconsistent/yielding/loose soils are encountered, we recommend that they be undercut and replaced with structural fill prior to the construction of floor slabs.

We recommend that a perimeter drainage system be provided for the below grade slab. The perimeter drainage system should be installed around the below grade walls. These drains may flow by gravity to a sump within the basement or to a storm sewer (if possible). The perimeter drain should consist of a 6-inch slotted, corrugated pipe surrounded by at least 6 inches of INDOT No. 5 stone.

The stone should be completely wrapped in a drainage geotextile consisting of Mirafi 140N or equivalent, in order to keep the stone clean or avoid clogging of the drainage layer with silt and sand. In addition, the zone adjacent to the below grade walls should be backfilled with a minimum 2 feet wide zone of free draining granular material (less than 3% by weight passing the No. 200 sieve) to prevent the buildup of hydrostatic pressure behind walls. Above this free draining material, a 2 feet thick clay fill should be compacted at the surface to prevent surface water infiltration. The clay fill should be compacted to a minimum of 95% of the maximum Standard Proctor dry density (ASTM D-698).

As part of the underslab drainage system, the below grade slab should be supported by a minimum 9-inch-thick open graded (i.e., Indiana Department of Transportation (INDOT) No. 5 crushed stone) bearing on a suitably prepared subgrade (Refer to Section 5.0 “Construction Considerations”). We recommend that a system of perforated drainpipes, which could drain by gravity to an outlet or sump pit, be installed into the granular fill. The drains consist of 4-inch slotted corrugated pipes surrounded by at least 6-inches of No. 5 stone. The stone should be completely wrapped in a drainage geotextile consisting of Mirafi 140N or equivalent. A layer of geotextile fabric should be placed between the natural subgrade and the drainage blanket. The underslab drainage layer should not extend under the basement walls in order to limit the water seepage to only that comes through the basement slab area. The underslab drainage and the perimeter drainage should be independent of each other.

However, if perimeter and underslab drainage will not be used for the wastewater treatment below grade structures, pressure relief valves may be used if drainage of water is not imperative for the below grade structures. The structural engineer should verify that the wastewater treatment plant processes will not cause liability issues with the use of relieve valves.

5.4.3 General Floor Slab Considerations

We recommend that all floor slabs be designed as "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations. Additionally, we recommend that all slabs should be liberally jointed and designed with the appropriate reinforcement for the anticipated loading conditions.

The building floor slabs should be supported on a minimum 6-inch-thick well-compacted granular base course (i.e. Indiana Department of Transportation (INDOT) No. 53 crushed stone) bearing on a suitably prepared subgrade (Refer to Section 6.0). The granular base course is expected to help distribute loads and equalize moisture conditions beneath the slab.

Provided that the recommendations above for floor slab design and construction are followed, a modulus of subgrade reaction, "K_{30}" value of 75 pounds per cubic inch (pci), is recommended for the design of ground supported floor slabs. It should be noted that the "K_{30}" modulus is based on a 30-inch diameter plate load empirical relationship.

5.5 Lateral Earth Pressures

The soil parameters provided herein are estimated based on the samples obtained from the soil borings and from our experience with similar sites. The magnitude of the lateral earth pressure is dependent on the method of backfill placement, the type of backfill soil, drainage provisions and whether the wall is permitted to yield during and/or after placement of the backfill. When a wall is held rigidly against horizontal movement, the lateral pressure against the wall is greater than the "active" earth pressure that is typically used in the design of free-standing retaining walls. Therefore, rigid walls should be designed for higher "at-rest" pressures (using an at-rest lateral earth pressure coefficient, K_o), while yielding walls can be designed for active pressures (using an active lateral earth pressure coefficient, K_a).

The foundation and/or basement walls proposed for the project site are expected to be rigid walls. Therefore, provided **a clean well-graded granular material is used for backfill**, a total soil unit weight (γ_t) of 125 pcf, an at-rest lateral earth pressure coefficient (K_o) of 0.45, an active lateral earth pressure coefficient (K_a) of 0.30, and a passive lateral earth pressure coefficient (K_p) of 3.4 can be used for calculating the lateral earth pressures. An equivalent fluid active pressure of 38 psf per foot of wall height is recommended for design purposes in conditions where the top of the wall is allowed to yield during backfilling. However, if the top of the wall will be fixed, an equivalent fluid at-rest pressure of 57 psf per foot of wall height is recommended for design purposes. This equivalent fluid pressure would increase linearly from zero (0) psf at the ground surface, to a maximum at the base of the wall.

Due to the wall being positioned on the slope with a creek at its base, we recommend that any passive pressures be carefully applied in design. When calculating passive earth pressure, the upper 3 feet of soil should be neglected. Note also that the wall must move laterally about 0.04H (where H equals the wall height) for passive earth pressures to be fully developed. In most cases, passive earth pressures behind walls should not be considered.

If hydrostatic pressure due to water build-up against the wall is anticipated, the equivalent fluid pressure method will be changed for the soil. Rather, the lateral earth pressure should be computed using a total soil unit weight of 125 pcf above the highest anticipated water level, and a buoyant soil unit weight of 63 pcf below the highest anticipated water level. The earth pressure coefficient indicated above should be used above and below the water level to compute the lateral earth pressure. The hydrostatic pressure should be computed using the highest anticipated water level. The lateral earth pressure and hydrostatic pressure should be added to obtain the total lateral pressure on the wall.

It has been assumed that the static weight per axle of equipment utilized for the compaction of the backfill materials adjacent to the below-grade wall will not exceed 2 tons per axle for non-vibratory equipment and 1 ton per axle for vibratory equipment. All heavy equipment, including compaction equipment heavier than recommended above, should not be allowed closer to the wall (horizontal distance) than the vertical distance from the backfill surface to the bottom of the wall.

The shear resistance against base sliding can be computed by multiplying the minimum normal force on the base of the footing times a coefficient of friction of 0.3. Lateral earth pressures can be computed as discussed above. A minimum factor of safety of 1.5 is recommended for sliding stability.

Table 5. Summary of Lateral Earth Design Pressures

Soil Unit Weight (γ_t) (pcf)	At-Rest Coefficient (K_o)	Active Coefficient (K_a)	Passive Coefficient (K_p)	Coefficient of Friction	Minimum Factor of Safety to be Utilized
125	0.45	0.30	3.4	0.3	1.5

5.6 Seismic Considerations

For structural design purposes, we recommend using a **Site Classification of "D"** as defined by the 2014 Indiana Building Code (modified 2012 International Building Code). It should be noted that a Site Class of D could be achieved with deeper borings. Along with using a Site Classification of D, we recommend the use of the maximum considered spectral response acceleration and design spectral response acceleration coefficients provided in Table 6 below.

Table 6. Seismic Design Spectral Response Acceleration Coefficients

Period (seconds)	Maximum Considered Spectral Response Acceleration Coefficient	Soil Factor	Design Spectral Response Acceleration Coefficient
0.2	S_S = 0.297 g	1.6	S_{DS} = 0.309 g
1.0	S_1 = 0.126 g	2.3	S_{D1} = 0.193 g

These values were obtained from the "ATC Hazards" program for seismic design, developed by the United States Geological Survey (USGS) Earthquake Hazard Program, utilizing the coordinates (38°54'05.3"N 86°54'58.8"W) for identifying the location of the site. Other earthquake resistant design parameters should be applied consistent with the minimum requirements of the 2014 Indiana Building Code.

5.7 Subsurface Utilities

For installation of subsurface utilities (i.e., water lines, storm-sewer lines, sanitary-sewer lines, manholes, culverts, etc.) the soil conditions encountered in our borings should be readily excavated using conventional earthwork equipment. Additionally, highly weathered zones of sandstone can be excavated with conventional equipment. However, it should be noted that ripping in the slightly weathered and unweathered sandstones will be needed.

Depending on seasonal conditions and the invert elevations of the proposed subsurface utilities, localized and sporadic groundwater infiltration may be expected to be encountered in the subsurface utility excavations (Refer to Section 5.5 "Groundwater Considerations").

In regard to bearing and support of the subsurface utilities, the soil and rock conditions encountered in our borings, if properly prepared, are suitable for support of the proposed subsurface utilities.

5.8 Force Main

As previously mentioned, we understand that the proposed force main will be SDR 26 12-inch diameter alignment bearing approximately 11 to 20 feet below existing grades. We understand that installation will include either open cut construction or trenchless technology construction (directional drilling).

5.8.1 Open Cut Construction

The feasibility of performing open-cut excavations will be influenced by several factors including easement widths/excavation limits, groundwater conditions and control, and the location of existing utilities and structures. The contractor shall evaluate the need for temporary retention (in conjunction with our recommendations in this section) prior to excavation and is completely responsible for selection, design, installation, and satisfactory performance of the retention system. The design of the retention system should not only take into account the lateral forces but also the tolerable lateral deflections. In areas where the excavation is in close proximity to existing structures, we recommend that a preconstruction survey of these structures be performed prior to construction. In addition, periodic survey monitoring (of both the structure and retention system) during construction is recommended. The contractor's "responsible person" should also establish a minimum lateral distance from the crest of the slope or excavation for all spoil piles and construction equipment. Likewise, the contractor's "responsible person" should establish protective measures for exposed faces.

The following are our recommendations for temporary open-cut excavation slopes based on subsurface conditions revealed by the borings in this exploration. These recommendations are based on the assumption that groundwater will be effectively controlled by dewatering. Inadequate groundwater management could cause unstable slopes that may require additional flattening of slopes, installation of intermediate benches and possibly a retention system.

All open-cut excavations deeper than 5 feet (up to 20 feet) should, as a minimum, be performed per current OSHA Excavation Regulations. Open-cut excavations deeper than 20 feet should be designed by a registered professional engineer.

The location of existing utilities to remain operational during construction and adjacent structures (including basement information) should be taken into consideration in evaluating the feasibility of an open cut excavation. Where sufficient space is available, the excavation slopes should, as a minimum, be laid back in accordance with current OSHA Excavation Regulations. If open-cut excavation is not feasible, consideration could be given to use of trench boxes for temporary retention or a combination of open-cut excavation and trench boxes. In areas where temporary retention is required, it is important that the retention system be installed prior to the excavation.

B-1 through B-4, performed along/near force main alignment, encountered very soft to stiff cohesive soils and very loose to medium dense sands at various depths; these granular soils are expected to be free-flowing and will tend to readily cave and/or slough into excavations. It should be noted that sandstone (encountered elsewhere) was not observed within these borings.

It is recommended that the temporary excavation slopes be examined periodically to evaluate potential destabilizing effects. The presence of perched water within the walls of the temporary excavations (wet seams and layers) could require flatter temporary slopes than those recommended. The stockpiling of excavated soils and rock at/near the top of the excavation can impact the stability of the excavation slopes. We recommend that the excavated soils and rock be stockpiled a minimum of 10 feet away from the top of the excavation to minimize surcharge effects on the slope. The operation/storage of heavy construction equipment near the top of the excavation slope and its impact on the stability of the slope should be further evaluated to determine appropriate setbacks.

Excavations in the vicinity of slopes should be performed with extreme care. In these areas, we recommend the excavations be performed in maximum 20-foot-long sections to minimize disturbance of the slope. Each section should be backfilled prior to opening up the adjacent one. Temporary retention (as needed) should be in-place prior to beginning the excavation. We recommend flowable fill be used to backfill excavations in the vicinity of slopes.

5.8.2 Trenchless Installation

As mentioned previously, it is our understanding that the proposed force main depth is approximately 11 to 20 feet below existing grades. ***As indicated earlier, clayey and sandy soils* were noted in our borings.** The contractor should choose an appropriate trenchless technology based on the soil conditions presented in this report and the proposed invert elevations.

5.8.3 Pipe Bedding

In general, pipe bedding should consist of relatively clean, well-graded aggregate and meet all local requirements. The excavated soils for this project are generally not suitable for use as pipe bedding. We offer these general comments on pipe bedding for consideration.

It is recommended that granular pipe bedding material be used and consist of well-graded sand and gravel with no more than 10% passing the No. 200 sieve. This granular material should not be less than 6 inches in thickness below the bottom of the pipe and should extend to a height of at least 12 inches above the top of the pipe. This material should be moisture conditioned to within + 2% of its optimum moisture content and compacted to at least 95% of Standard Proctor maximum dry density, ASTM D 698. The compaction of material above the pipe should be performed with caution to prevent pipe damage. The remaining trench backfill above the granular zone previously described, shall consist of backfill as described in the following section.

6.0 CONSTRUCTION CONSIDERATIONS

6.1Site Preparation

All areas that will support foundations, floors, pavements, or newly placed structural fill must be properly prepared. All loose surficial soil or "topsoil" and other unsuitable materials must be removed. Unsuitable materials include frozen soil, relatively soft material, relatively wet soils, deleterious material, or soils that exhibit a high organic content.

About 1 to 13 inches of loose surficial topsoil was encountered in the borings. The topsoil was measured at discrete locations as shown on the Boring Location Map (Appendix A). The topsoil thickness measured at the boring locations may or may not be representative of the overall average topsoil thickness at the site. Therefore, it is possible that the actual stripping depth will significantly vary from this data. The data presented should be viewed only as a guide to the minimum stripping depth that will be required to remove organic material at the surface.

After stripping or in cut areas where floor slabs or pavements or new structural fill is to be placed, the exposed subgrade must be evaluated by a Patriot representative. The upper 12 inches of subgrade should be scarified and compacted to a dry density of at least 100 percent of the Standard Proctor maximum dry density (ASTM D-698); then proofrolling of the subgrade should be performed.

Proofrolling should consist of repeated passes of a loaded, pneumatic-tired vehicle such as a tandem-axle dump-truck or scraper. The proofrolling operations should be observed by a *Patriot* representative, and the proofrolling vehicle should be loaded as directed by *Patriot*. Any area found to rut, pump, or deflect excessively should be compacted in-place or, if necessary, undercut and replaced with structural fill, compacted as specified below.

Care must be exercised during grading and fill placement operations. ***The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near surface soils. The severity of this potential problem depends to a great extent on the weather conditions prevailing during construction.*** The contractor must exercise discretion when selecting equipment sizes and make a concerted effort to control construction traffic and surface water while the subgrade soils are exposed. We recommend that heavy construction equipment (i.e., dump trucks, scrapers, etc.) be rerouted away from the building and pavement areas. If such problems do arise, the operations in the affected area should be halted and the *Patriot* representative contacted to evaluate the condition.

6.2 Foundation Excavations

Excavation may be performed on sandy soils that can be easily disturbed. If the subgrade soil is disturbed, it should be re-compacted, or a crushed stone layer should be placed at the subgrade level.

Upon completion of the foundation excavations and prior to the placement of reinforcing steel, a *Patriot* representative should observe the exposed subgrade to confirm that a bearing surface of adequate strength has been achieved. Any localized soft soil zones encountered at the bearing elevations should be further excavated until adequate support soils are encountered. The cavity should be backfilled with structural fill as defined below, or the footing can be poured at the excavated depth. Structural fill used as backfill beneath footings should be limited to lean concrete, well-graded sand and gravel, or crushed stone placed and compacted in accordance with Section 6.0.

If it is necessary to support spread footings on structural fill, the fill pad must extend laterally a minimum distance beyond the edge of the footing. The minimum structural pad width would correspond with a point at which an imaginary line extending downward from the outside edge of the footing at a 1H:2V slope intersects the surface of the natural soils. For example, if the depth to the bottom of excavation is 4 feet below the bottom of the foundation, the excavation would need to extend laterally beyond the edge of the footing at least 2 feet, as shown in Illustration A, found at the conclusion of this report.

Excavation slopes should be maintained within OSHA requirements. We recommend that any surcharge fill or heavy equipment be kept at least 5 feet away from the edge of the excavation. In addition, excavations that occur near existing in-use foundations should be carefully performed making a conscious effort not to undermine the support of the in-use foundations. If it is necessary to excavate soil adjacent to and below the bearing elevation of any in-use foundations**,** Patriot should be contacted to make further recommendations regarding these excavations. Please refer to Illustration B at the end of this report for further details**.** A trench safety plan was beyond the scope of our services for this project.

Construction traffic on the exposed surface of the bearing soil will potentially cause some disturbance of the subgrade and consequently loss of bearing capacity. However, the degree of disturbance can be minimized by proper protection of the exposed surface.

6.3 Structural Fill and Fill Placement Control

Structural fill, defined as any fill which will support structural loads, should be clean and free of organic material, debris, deleterious materials, and frozen soils. Samples of the proposed fill materials should be tested prior to initiating the earthwork and backfilling operations to determine the classification, the natural and optimum moisture contents and maximum dry density and overall suitability as a structural fill. **Structural fill should have a Liquid Limit (LL) less than 40 and a Plasticity Index (PI) between 10 and 20.**

6.3.1 Existing Site Materials

Regarding the suitability of the on-site soils for use as structural fill, the upper few feet of these soils are expected to be wetter than the estimated optimum moisture contents, depending on the prevailing weather conditions at the time of construction. Therefore, scarification and/or drying may be required to reduce the moisture content of the soils to achieve adequate compaction of the clays and proper strength.

6.3.2 Fill Placement Control

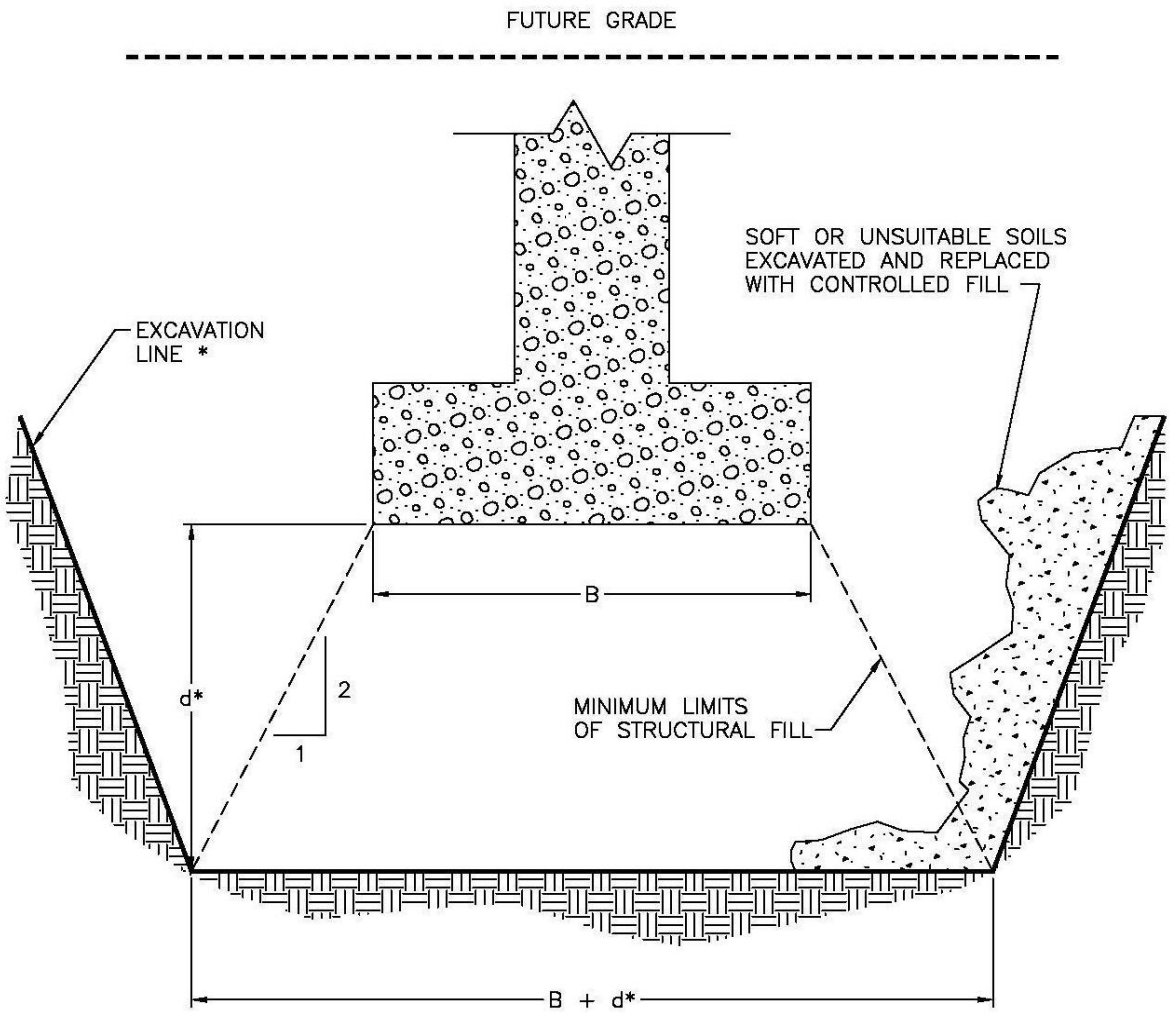
All structural fill beneath floor slabs, adjacent to foundations and over foundations, should be compacted to at least 98 percent of its maximum Standard Proctor dry density (ASTM D-698). This minimum compaction requirement should be increased to 100 percent of the maximum Standard Proctor dry density for fill supporting footings, provided these are designed as outlined in Recommendations, Section 5.0.

Structural fill supporting, around and over utilities should be compacted to at least 95 % of its maximum Standard Proctor dry density (ASTM D-698) for utilities underlying structural areas (i.e., buildings, pavements, sidewalks, etc.). However, the minimum compaction requirement can be reduced for backfill around and over the utilities to 90 % of the maximum Standard Proctor dry density where utilities underlie greenbelt areas (i.e., grassy lawns, landscaping, etc.). It is recommended that a clean well-grade granular material be utilized as the bedding material, as well as the backfill material around and over the utility lines.

To achieve the recommended compaction of the structural fill, we suggest that the fill be placed and compacted in layers not exceeding 8 inches in loose thickness (the loose lift thickness should be reduced to 6 inches when utilizing small hand compactors) and within the range of 2 percentage (%) points below or above the optimum moisture content value. All fill placement should be monitored by a *Patriot* representative. ***Each lift should be tested for proper compaction at a frequency of at least one (1) test every 2,500 square feet (ft^2) per lift for the building areas, at least and at a frequency of at least one (1) test for every 50 lineal feet of utility installation*.**

6.4 Groundwater

Groundwater was observed in six (6) borings during drilling and in three (3) borings on completion. Localized and sporadic groundwater infiltration will occur into the foundation excavations on this site. Groundwater inflow into shallow excavations **above** the groundwater table is expected to be adequately controlled by conventional methods such as gravity drainage and/or pumping from sumps. More significant inflow can be expected in deeper excavations **below** the groundwater table requiring more aggressive dewatering techniques, such as well or wellpoint systems. For groundwater to have minimal effects on the construction, foundation excavations should be constructed and poured in the same day, if possible.

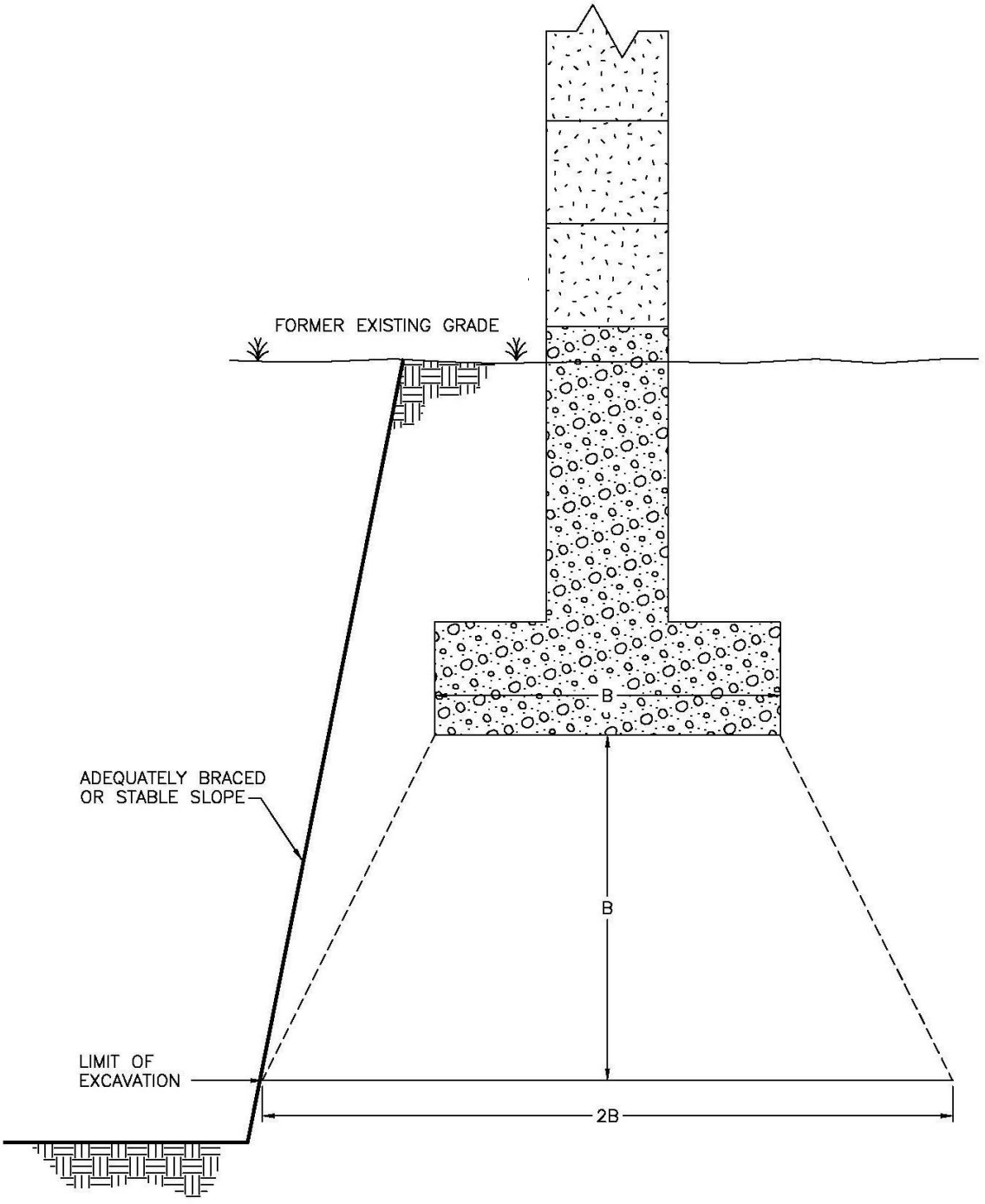


*d IS DEPTH TO SUITABLE SOILS

* IN COMPLIANCE WITH OSHA STANDARDS

PATRIOT ENGINEERING
and Environmental, Inc.
2568 Kohnle Drive
Miamisburg, Ohio 45342
(937) 847-9707 Fax: (937) 847-9720

Excavation for Footings
In an Area of Fill
ILLUSTRATION A



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2568 Kohnle Drive
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(937) 847-9707 Fax: (937) 847-9720

Excavation Near Existing
In Use Foundation
ILLUSTRATION B

APPENDIX A

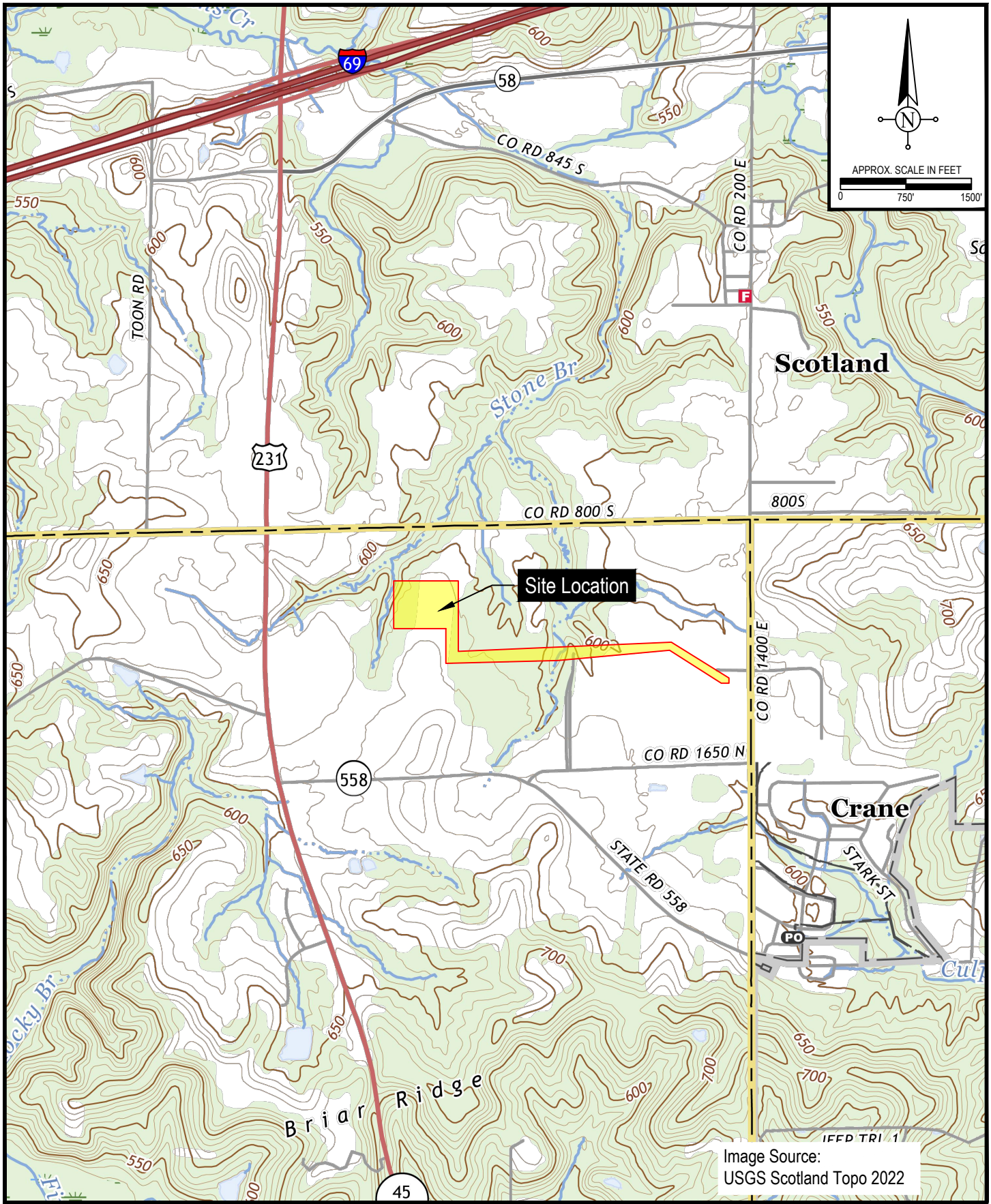
Site Vicinity Map (Figure 1)

Soil Boring Location Map (Figures 2 & 3)

Boring Logs

Boring Log Key

Unified Soil Classification System (USCS)



Patriot Engineering & Environmental, Inc.

Project: Westgate WWTP
Innovation Drive & West Gate Drive
Crane, Indiana

	Drawn By: J. DuMond
Project Number:24-0293-01	Approved: B. Lauletta
Date: June 3, 2024	DWG: 24-0293-01_geo

Figure 1

Site Vicinity Map

Patriot Engineering & Environmental, Inc.

LEGEND

PATRIOT Soil Boring

B-1 Soil Boring ID

NOTES:

1. Boring locations were staked by PATRIOT. All locations are shown as approximate.
2. All locations were determined in the field with references to existing landmarks.
3. Image Source: Bing Maps
4. Scale as shown.

Project: Westgate WWTP
Innovation Drive & West Gate Drive
Crane, Indiana

	Drawn By: J. DuMond
Project Number: 24-0293-01	Approved: B. Lauletta
Date: June 3, 2024	DWG: 24-0293-01_geo

Figure 2

Soil Boring Location Map

Patriot Engineering & Environmental, Inc.

LEGEND
PATRIOT Soil Boring
B-1 Soil Boring ID

NOTES:
1. Boring locations were staked by PATRIOT. All locations are shown as approximate.
2. All locations were determined in the field with references to existing landmarks.
3. Image Source: Bing Maps
4. Scale as shown.

Project: Westgate WWTP
Innovation Drive & West Gate Drive
Crane, Indiana

	Drawn By: J. DuMond
Project Number: 24-0293-01	Approved: B. Lauletta
Date: June 3, 2024	DWG: 24-0293-01_geo

Figure 3

Soil Boring Location Map

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LOG OF BORING B-1

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/07/2024	Latitude	: 38°53'58.53"N
Drilling Method	: HSA	Longitude	: 86°54'17.46"W

Water Levels
- During Drilling - 8.5 feet
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	USCS	Description	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			TOPSOIL (10")						
		CL	Brown, moist, very soft, SILTY CLAY with trace sand	1	67	1/1/1	0.7	24	
5		CL	Brown and gray, moist, stiff, SILTY CLAY with little sand	2	54	ST	1.2	19	Sample No. 2: Shelby tube pushed from 3 to 5 feet.
		SC	Brown and gray, slightly moist, loose, CLAYEY SAND	3	100	3/4/5			Unit Weight Test: Wet Unit Weight = 131.2 pcf Dry Unit Weight = 109.9 pcf
10		SP-SM	Brown, saturated, loose, fine to medium grained, SAND with trace silt	4	56	2/3/5			Sample No. 2: Unconfined Compressive Strength Test Qu = 1.6 tsf
15		CL	Brown and gray, moist, stiff, SILTY CLAY with trace sand and trace sandstone	5	56	3/4/7	3.4	23	Boring caved to 12 feet upon auger removal.
20		SP-SM	Brown, saturated, medium dense, fine to medium grained, SAND with trace silt, trace gravel, and trace sandstone	6	44	6/7/10			
25			Boring terminated at 20 feet.						
30									
35									
40									
45									
50									

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LOG OF BORING B-2

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/07/2024	Latitude	: 38°54'2.21"N
Drilling Method	: HSA	Longitude	: 86°54'25.65"W

Water Levels
- During Drilling - 8.5 feet
- After Completion - 13 feet
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	USCS	Description	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			TOPSOIL (13")						
		CL	Brown and gray, moist, medium stiff, SILTY CLAY with trace sand	1	78	3/4/4	2.4	23	
5		SC	Brown and gray, slightly moist, medium dense, CLAYEY SAND	2	89	3/5/8			
				3	89	2/6/8			
10		SP-SM	Black to brown, saturated, very loose, fine to medium grained, SAND with trace silt and trace gravel	4	67	2/2/2			
15		SP-SM	Brown, saturated, very loose, fine to medium grained, SAND with trace silt and trace gravel	5	78	1/1/1			Boring caved to 14.5 feet upon auger removal.
20		SP-SM	Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	67	3/4/7			
			Boring terminated at 20 feet.						
25									
30									
35									
40									
45									
50									

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LOG OF BORING B-2A

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Shelby Tube
Logged By	: J. Rogers	Approx. Elevation	: +/- feet
Start Date	: 05/07/2024	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					Blank drilled from 0 to 3 feet. Refer to Boring B-2 for a description of soil strata.						Boring B-2A offset 3 feet south from boring B-2.
5			CL		Brown and gray, slightly moist, stiff, SANDY CLAY with interbedded sand seams	1	100	ST	4.6	15	Sample No. 1: Shelby tube pushed from 3 to 5 feet.
					Boring terminated at 5 feet.						Unit Weight Test: Wet Unit Weight = 133.5 pcf Dry Unit Weight = 115.7 pcf Unconfined Compressive Strength Test Qu = 1.1 tsf
10											
15											
20											
25											
30											
35											
40											
45											
50											

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Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-3

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/07/2024	Latitude	: 38°54'1.65"N
Drilling Method	: HSA	Longitude	: 86°54'36.54"W

Water Levels
▼ During Drilling - 8 feet
▽ After Completion - 10 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (7")						
			CL		Brown and gray, moist, stiff, SANDY CLAY	1	78	4/5/6	3.3	20	
5			CL		Brown and gray, moist, stiff, SANDY CLAY	2	92	ST	2.0	18	Sample No. 2: Shelby tube pushed from 3 to 5 feet.
			SC		Gray, slightly moist, medium dense, CLAYEY SAND	3	89	3/4/7			Unit Weight Test: Wet Unit Weight = 130.9 pcf Dry Unit Weight = 110.6 pcf
10		▽	SP-SM		Brown, saturated, loose, fine to medium grained, SAND with trace silt	4	78	3/3/7			Sample No. 2: Unconfined Compressive Strength Test Qu = 1.0 tsf
15			SP-SM		Brown, saturated, very loose, fine to medium grained, SAND with trace silt	5	78	1/2/2			
20			CL		Brown and gray, moist, stiff, SANDY CLAY	6	67	3/5/7	1.8	18	Boring caved to 20 feet upon auger removal.
25			SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt	7	89	5/6/9			
30			SP-SM		Brown to gray, saturated, medium dense, fine to medium grained, SAND with trace silt	8	56	7/8/8			
35			SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt	9	67	6/7/9			
40			SP-SM		Brown to gray, saturated, medium dense, fine to medium grained, SAND with trace silt	10	17	5/7/7			
45					Boring terminated at 40 feet.						
50											

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LOG OF BORING B-4

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/07/2024	Latitude	: 38°54'1.01"N
Drilling Method	: HSA	Longitude	: 86°54'49.15"W

Water Levels
- During Drilling - 18.5 feet
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
			CL		Brown and gray, moist, medium stiff, SANDY CLAY	1	89	3/3/5	2.8	18	
5			CL		Brown and gray, moist, medium stiff, SANDY CLAY	2	100	ST	1.8	16	Sample No. 2: Shelby tube pushed from 3 to 5 feet.
			SC		Brown and gray, slightly moist, medium dense, CLAYEY SAND	3	89	6/6/7			Unit Weight Test: Wet Unit Weight = 130.4 pcf Dry Unit Weight = 112.2 pcf
10						4	89	3/5/7			Sample No. 2: Unconfined Compressive Strength Test Qu = 0.8 tsf
15			SC		Brown and gray to gray, slightly moist, loose, CLAYEY SAND	5	56	4/5/5			Boring caved to 13 feet upon auger removal.
20		▼	SM		Brown, saturated, medium dense, SILTY SAND	6	56	4/5/7			

Boring terminated at 20 feet.

25
30
35
40
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LOG OF BORING B-5

Westgate WWTP
Innovation Drive and West Gate Drive
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	:	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	: 38°54'5.62"N
Drilling Method	: HSA	Longitude	: 86°54'56.12"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			CL		TOPSOIL (1") Brown, slightly moist to moist, SANDY CLAY	1	17	2/6/6	2.9	15	
						2	67	3/4/5	1.4	16	
5			SC		Brown and gray, slightly moist, loose, CLAYEY SAND	3	89	4/5/5			
10			SC		Gray, slightly moist, loose, CLAYEY SAND	4	89	4/4/6			Boring caved to 11 feet upon auger removal.
15			CL		Brown and gray, moist, medium stiff, SILTY CLAY with trace sand	5	56	3/4/4	3.9	23	
					Boring terminated at 15 feet.						Groundwater was not encountered during drilling, nor upon completion.
20											
25											
30											
35											
40											
45											
50											

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LOG OF BORING B-6

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	: 38°54'7.85"N
Drilling Method	: HSA	Longitude	: 86°54'56.26"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (1")						
			SC		Brown and gray, slightly moist, medium dense, CLAYEY SAND	1	78	3/6/6			
						2	78	6/8/10			
5			CL		Brown and gray, moist, stiff, SANDY CLAY	3	89	4/6/5	2.9	17	
			CL		Brown, gray, and black, moist, stiff, SANDY CLAY	4	78	3/4/5	1.5	19	
10											Boring caved to 12 feet upon auger removal.
			CL		Brown, very moist, medium stiff, SILTY CLAY with little sand	5	67	3/4/4	0.9	31	
15					Boring terminated at 15 feet.						Groundwater was not encountered during drilling, nor upon completion.
20											
25											
30											
35											
40											
45											
50											

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LOG OF BORING B-6A

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Shelby Tube
Logged By	: E. Bergel	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					Blank drilled from 0 to 6 feet. Refer to Boring B-6 for a description of soil strata.						Boring B-6A offset 3 feet south from boring B-6.
5			CL		Brown and gray, moist, stiff, SANDY CLAY with trace gravel	1	100	ST	4.5	17	Sample No. 1: Shelby tube pushed from 6 to 8 feet. Unit Weight Test: Wet Unit Weight = 131.4 pcf Dry Unit Weight = 112.2 pcf Unconfined Compressive Strength Test Qu = 1.6 tsf
10					Boring terminated at 8 feet.						
15											
20											
25											
30											
35											
40											
45											
50											

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PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-7

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/06/2024	Latitude	: 38°54'5.76"N
Drilling Method	: HSA	Longitude	: 86°54'57.66"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (1")						
			CL		Brown, moist, stiff, SANDY CLAY	1	78	3/5/6	2.5	16	
5			CL		Brown and gray, moist, stiff, SANDY CLAY	2	78	4/5/7	3.0	20	
			CL		Brown and gray, moist, stiff, SANDY CLAY with trace gravel	3	73	ST	2.5	18	Sample No. 3: Shelby tube pushed from 6 to 8 feet.
10			CL		Brown and gray, moist, very stiff, SANDY CLAY with trace gravel	4	78	7/7/10	2.0	17	Unit Weight Test: Wet Unit Weight = 128.7 pcf Dry Unit Weight = 108.8 pcf
15			CL		Brown and gray, moist, stiff, SANDY CLAY with trace gravel and interbedded silt seams	5	67	5/7/8	2.9	24	Sample No. 3: Unconfined Compressive Strength Test Qu = 1.8 tsf
20					Brown and gray, highly weathered, SANDSTONE	6	22	24/50-3"			
25					Gray, highly weathered, SANDSTONE	7	22	50-4"			Boring caved to 24 feet upon auger removal.
30						8	22	50-4"			
					Boring terminated at 30 feet.						Groundwater was not encountered during drilling, nor upon completion.
35											
40											
45											
50											

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LOG OF BORING B-8

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	: 38°54'6.58"N
Drilling Method	: HSA	Longitude	: 86°54'58.77"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (1")						
			CL		Brown and gray, moist, stiff, SANDY CLAY	1	78	3/4/6	2.6	19	
						2	78	2/5/7	3.4	18	
5						3	0	3/5/5			Sample No. 3: Two attempts were made to obtain a splitspoon sample. Classification is based on field observations.
			CL		Brown, gray, and black, moist, stiff, SANDY CLAY with trace gravel	4	67	3/4/5	2.8	18	Boring caved to 10 feet upon auger removal.
10											
			CL		Brown, moist, stiff, SANDY CLAY with trace gravel	5	67	3/4/5	1.4	21	
15											
			SM		Brown, slightly moist, medium dense, SILTY SAND	6	56	6/12/9			
20					Boring terminated at 20 feet.						Groundwater was not encountered during drilling, nor upon completion.
25											
30											
35											
40											
45											
50											

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LOG OF BORING B-9

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	: 38°54'6.19"N
Drilling Method	: HSA	Longitude	: 86°54'59.52"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (1")						
			CL		Brown and gray, moist, stiff, SANDY CLAY	1	78	3/4/6	2.9	20	
						2	89	4/6/8	2.5	16	
5					Brown, moist, stiff, SANDY CLAY	3	67	3/4/7	3.2	19	
			CL			4	78	4/7/8	2.1	19	
10					Brown, slightly moist, very stiff, SANDY CLAY with trace sandstone	5	78	8/11/11		9	
			CL								Boring caved to 17 feet upon auger removal.
15					Gray, slightly moist, very stiff, SANDY CLAY with interbedded sand seams	6	67	6/16/13	4.4	12	
			CL								
20					Gray, slightly moist, very stiff, SANDY CLAY with trace sandstone and interbedded sand seams	7	78	7/9/15	3.4	11	
			CL								
25					Gray, highly weathered, SANDSTONE	8	56	12/39/50-5"			
						9	17	50-3"			
30											
35					Boring terminated at 35 feet.						Groundwater was not encountered during drilling, nor upon completion.
40											
45											
50											

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LOG OF BORING B-9A

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Shelby Tube
Logged By	: E. Bergel	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					Blank drilled from 0 to 6 feet. Refer to Boring B-9 for a description of soil strata.						Boring B-9A offset 3 feet south from boring B-9.
5			CL		Brown and gray, moist, stiff, SANDY CLAY with trace gravel and interbedded sand seams	1	100	ST	2.4	18	Sample No. 1: Shelby tube pushed from 6 to 8 feet. Unit Weight Test: Wet Unit Weight = 132.9 pcf Dry Unit Weight = 112.9 pcf
10					Boring terminated at 8 feet.						Unconfined Compressive Strength Test Qu = 1.0 tsf
15											
20											
25											
30											
35											
40											
45											
50											

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LOG OF BORING B-10

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/02/2024	Latitude	: 38°54'5.77"N
Drilling Method	: HSA	Longitude	: 86°54'59.52"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (11")						
			CL		Brown and gray, moist, stiff, SANDY CLAY	1	78	3/4/5	3.7	17	
						2	78	4/5/6	2.7	18	
5					Brown and gray, moist, stiff, SANDY CLAY with trace gravel	3	89	4/4/6	2.2	19	
			CL			4	78	4/5/5	2.3	18	
10					Brown, moist, stiff, SANDY CLAY with trace gravel	5	89	4/5/8	3.6	16	Boring caved to 14 feet upon auger removal.
15			CL								
					Gray, slightly moist, very stiff, SANDY CLAY with trace gravel	6	67	8/9/12	>6.0	11	
20			CL								
					Gray, highly weathered, SANDSTONE	7	6	50-3"			
25											
						8	6	50-1"			
30					Boring terminated at 30 feet.						Groundwater was not encountered during drilling, nor upon completion.
35											
40											
45											
50											

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LOG OF BORING B-11

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/06/2024	Latitude	: 38°54'5.33"N
Drilling Method	: HSA	Longitude	: 86°54'59.52"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (1")						
			CL		Brown and gray, moist, stiff, SANDY CLAY	1	78	3/4/6	2.9	18	
						2	78	4/5/6	2.5	16	
5			CL		Brown and gray, moist, stiff, SILTY CLAY with little sand	3	88	ST	1.7	19	Sample No. 3: Shelby tube pushed from 6 to 8 feet.
			CL		Brown and gray, moist, stiff, SILTY CLAY with little sand	4	89	4/4/5	3.0	16	Unit Weight Test: Wet Unit Weight = 126.5 pcf Dry Unit Weight = 105.9 pcf
10			CL		Brown and gray, slightly moist, very stiff, SANDY CLAY with trace sandstone	5	89	6/8/12	4.2	12	Sample No. 3: Unconfined Compressive Strength Test Qu = 1.6 tsf
15					Brown and gray, highly weathered, SANDSTONE	6	89	8/25/41			
20					Gray, highly weathered, SANDSTONE	7	17	50-3"			Boring caved to 26 feet upon auger removal.
25						8	22	50-4"			
30						9	22	50-4"			
35					Boring terminated at 35 feet.						Groundwater was not encountered during drilling, nor upon completion.
40											
45											
50											

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LOG OF BORING B-12

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/06/2024	Latitude	: 38°54'5.37"N
Drilling Method	: HSA	Longitude	: 86°55'1.90"W

Water Levels
- During Drilling - 13.5 feet
- After Completion - 12 feet
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	USCS	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			TOPSOIL (11")						
		CL	Brown and gray, moist, stiff, SANDY CLAY	1	67	3/5/9	3.8	20	
				2	78	3/5/7	2.3	15	
5		CL	Brown and gray, moist, stiff, SILTY CLAY with trace sand	3	90	ST	5.3	24	Sample No. 3: Shelby tube pushed from 6 to 8 feet.
		CL	Brown and gray, moist, very stiff, SANDY CLAY with trace gravel	4	89	5/6/11		18	Unit Weight Test: Wet Unit Weight = 127.5 pcf Dry Unit Weight = 102.5 pcf
10		CL	Brown, moist, stiff, SANDY CLAY	5	44	3/4/6	0.4	23	Sample No. 3: Unconfined Compressive Strength Test Qu = 1.0 tsf
15			Gray, highly weathered, SANDSTONE	6	56	5/13/19			Boring caved to 15 feet upon auger removal.
20			Boring terminated at 20 feet.						
25									
30									
35									
40									
45									
50									

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LOG OF BORING B-13

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/06/2024	Latitude	: 38°54'6.35"N
Drilling Method	: HSA	Longitude	: 86°55'1.26"W

Water Levels
▼ During Drilling - 18.5 feet
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			CL		TOPSOIL (1") Brown, moist, stiff, SANDY CLAY	1	67	3/4/5	1.5	19	
5			CL		Brown and gray, slightly moist to moist, stiff, SANDY CLAY	2	78	4/4/5		17	
						3	78	3/4/6	3.3	12	
10						4	67	4/5/7	2.0	21	
15		▼				5	89	3/4/5	1.3	18	Boring caved to 14 feet upon auger removal.
20			CL		Brown, very moist, soft, SILTY CLAY with little sand	6	67	3/2/2		29	
25			CL		Gray, slightly moist, very stiff to hard, SANDY CLAY with trace gravel	7	78	4/7/12	2.6	14	
30					Boring terminated at 30 feet.	8	67	10/21/21	>6.0	8	Groundwater was not encountered during drilling, nor upon completion.
35											
40											
45											
50											

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LOG OF BORING B-14

Westgate WWTP
County Road 800 South
Crane, Indiana

Client Name	: American Structurepoint, Inc.	Driller	: E. Thomas
Project Number	: 24-0293-01G	Sampling	: Splitspoon
Logged By	: S. Lauletta	Approx. Elevation	: +/- feet
Start Date	: 05/06/2024	Latitude	: 38°54'7.77"N
Drilling Method	: HSA	Longitude	: 86°55'1.56"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (11")						
			CL		Brown, slightly moist, stiff, SANDY CLAY	1	78	3/4/5	2.7	15	
5			CL		Brown, gray, and black, moist, stiff, SANDY CLAY with trace gravel	2	78	3/5/8	2.7	17	
			CL		Brown and gray, moist, stiff, stiff, SANDY CLAY with trace gravel and interbedded sand seams	3	67	ST	2.9	20	Sample No. 3: Shelby tube pushed from 6 to 8 feet.
10			CL		Brown and gray, moist, very stiff, SANDY CLAY with trace gravel	4	11	8/10/12		17	Unit Weight Test: Wet Unit Weight = 130.3 pcf Dry Unit Weight = 108.5 pcf
15			SP		Brown, slightly moist, medium dense, fine to medium grained, SAND	5	67	7/12/15			Sample No. 3: Unconfined Compressive Strength Test Qu = 1.3 tsf
20			SM		Brown, slightly moist, medium dense, SILTY SAND	6	67	9/14/16			
25			CL		Gray, slightly moist, hard, SANDY CLAY with trace gravel	7	78	7/8/24	>6.0	8	Boring caved to 25 feet upon auger removal.
						8	78	7/19/27	>6.0	9	
30					Boring terminated at 30 feet.						Groundwater was not encountered during drilling, nor upon completion.
35											
40											
45											
50											

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PATRIOT ENGINEERING and Environmental, Inc.
Engineering Value for Project Success
Consulting Environmental, Geotechnical and Materials Engineers

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	-4 blows/ft. or less
Loose	-5 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Grain Size Terminology

Soil Fraction	Particle Size	US Standard Sieve Size
Boulders	Larger than 12”	Larger than 12”
Cobbles	3” to12”	3” to 12”
Gravel: Coarse	¾” to 3”	¾” to 3”
Small	4.76mm to ¾”	#4 to ¾”
Sand: Coarse	2.00mm to 4.76mm	#10 to #4
Medium	0.42mm to 2.00mm	#40 to #10
Fine	0.074mm to 0.42mm	#200 to #40
Silt	0.005mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005mm	Smaller than #200

RELATIVE PROPORTIONS FOR SOILS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Unconfined Compressive Strength (tons/sq. ft.)	Field Identification (Approx.) SPT Blows/ft.
Very Soft	Less than 0.25	0 - 2
Soft	0.25 – < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 -15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification on logs are made by visual inspection.

Standard Penetration Test - Driving a 2.0” O.D., $1^{3/8}$” I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for **Patriot** to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.).

Strata Changes - In the column “Soil Descriptions” on the drill log the horizontal lines represent strata changes. A solid line (————) represents an actually observed change, a dashed line (- - - - - -) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Groundwater symbols: ▼-observed groundwater elevation, encountered during drilling; ∇-observed groundwater elevation upon completion of boring.

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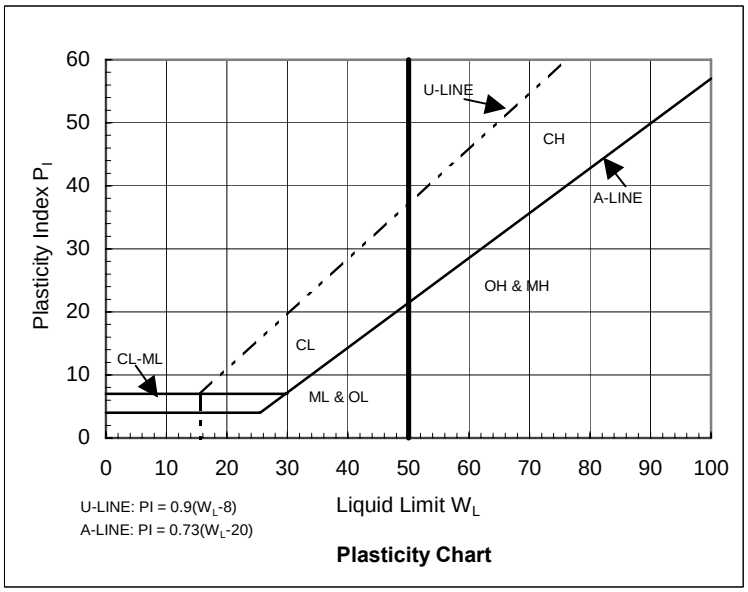
Unified Soil Classification System

Major Divisions			Group Symbol		Typical Names	Classification Criteria for Coarse-Grained Soils		
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{D^2_{30}}{D_{10} D_{60}}$
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)		
		Gravels with fines (appreciable amount of fines)	GM	d u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Above A line with $4 < P_I < 7$ are borderline cases requiring use of dual symbols	
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_I > 7$		
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{(D_{30})^2}{D_{10} D_{60}}$
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_c > 3$)		
		Sands with fines (appreciable amount of fines)	SM	d u	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Limits plotting in hatched zone with $4 \leq P_I \leq 7$ are borderline cases requiring use of dual symbols	
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_I > 7$		
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP More than 12% - GM, GC, SM, SC 5-12% - Borderline cases requiring dual symbols		
			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			
	Silts and clays (liquid limit >50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays or high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		PT		Peat and other highly organic soils			



Plasticity Chart

APPENDIX B

LABORATORY TEST RESULTS

Patriot Engineering and Environmental, Inc.
6150 E 75th Street
Indianapolis, IN 46250
317-576-8058

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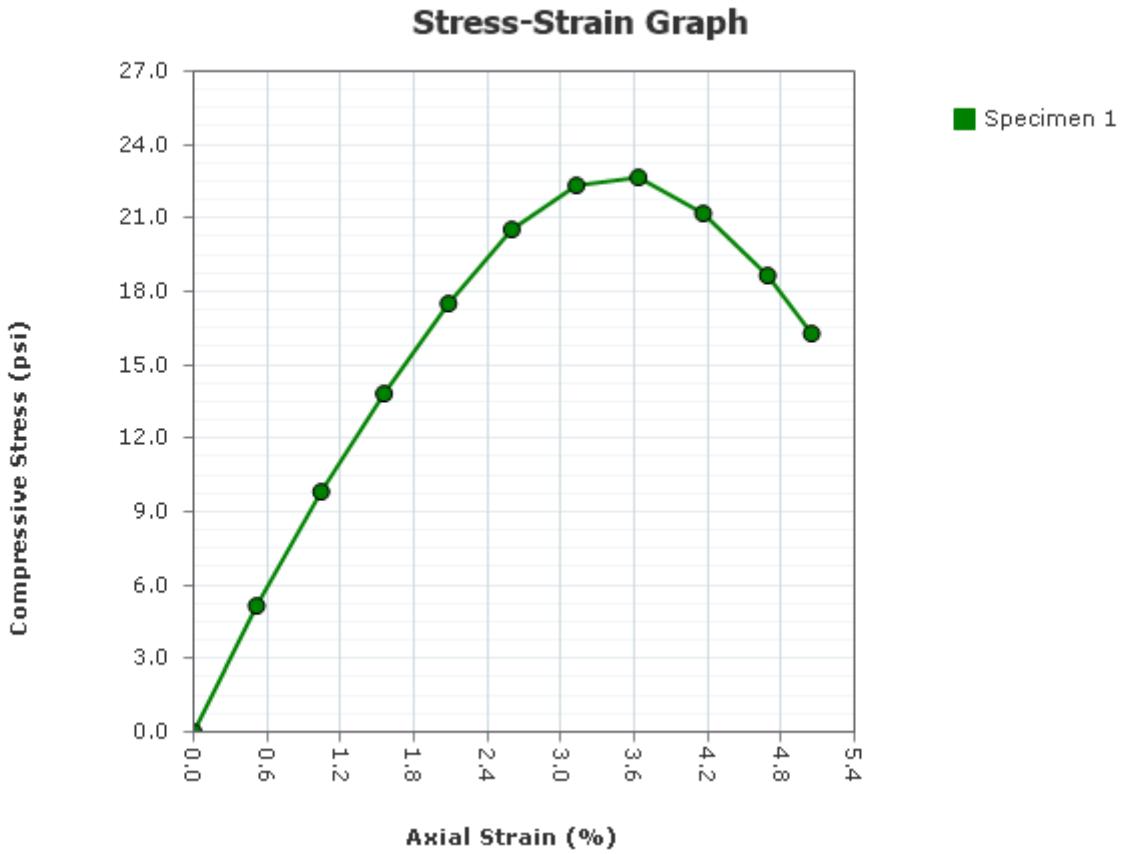
AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-1
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	19.3							
Wet Density (pcf)	131.2							
Dry Density (pcf)	109.9							
Saturation (%):	99.9							
Void Ratio:	0.516							
Height (in)	5.7468							
Diameter (in)	2.8470							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.02							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	22.6							
Undrained Shear Strength (psi)	11.3							
Strain at Failure (%):	3.6							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-1
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	E. Bergel	Test Time:	5/29/2024		

Specimen Description: Brown and gray SILTY CLAY with little sand

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.017152	0.0006	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	33.85148	0.0301	32.8	0.0295	0.5	6.399	5.2	5.1
2	00:01:00	64.09152	0.0604	63.1	0.0598	1.0	6.433	9.9	9.8
3	00:01:30	90.30232	0.0899	89.3	0.0894	1.6	6.467	14.0	13.8
4	00:02:00	114.9163	0.1202	113.9	0.1196	2.1	6.501	17.9	17.5
5	00:02:30	135.3447	0.1499	134.3	0.1494	2.6	6.536	21.1	20.6
6	00:03:00	147.9202	0.1803	146.9	0.1797	3.1	6.571	23.1	22.4
7	00:03:30	150.638	0.2094	149.6	0.2088	3.6	6.606	23.5	22.6
8	00:04:00	141.9726	0.2398	141.0	0.2393	4.2	6.643	22.1	21.2
9	00:04:30	125.8698	0.2701	124.9	0.2695	4.7	6.679	19.6	18.7
10	00:04:51	110.2024	0.2907	109.2	0.2902	5.0	6.704	17.2	16.3

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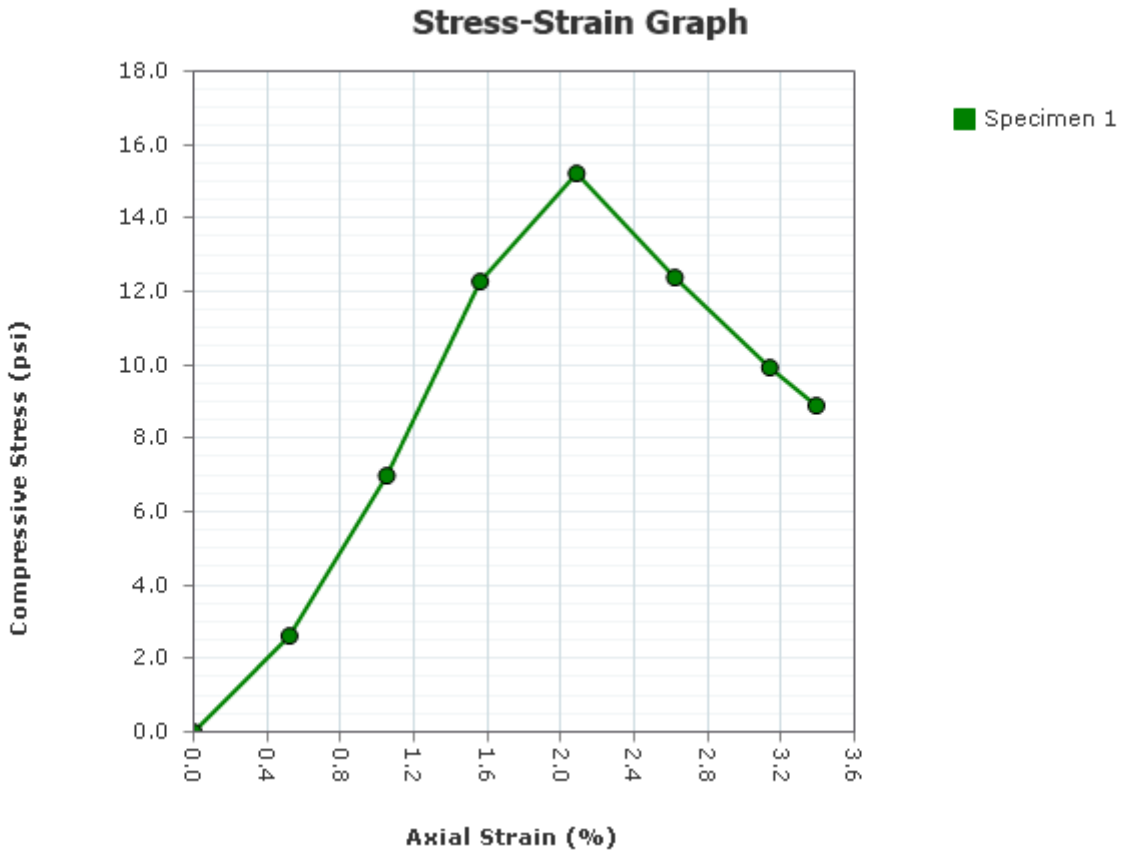
AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/7/2024
Sample Number:	S-1
Sample Depth:	3.0-5.0 ft
Boring Number:	B-2A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	15.4							
Wet Density (pcf)	133.5							
Dry Density (pcf)	115.7							
Saturation (%):	93.4							
Void Ratio:	0.441							
Height (in)	5.7305							
Diameter (in)	2.8590							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.00							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.05							
Unconfined Compressive Strength (psi)	15.2							
Undrained Shear Strength (psi)	7.6							
Strain at Failure (%):	2.1							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/7/2024
Sample Number:	S-1
Sample Depth:	3.0-5.0 ft
Boring Number:	B-2A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	E. Bergel	Test Time:	5/29/2024		

Specimen Description: Brown and gray SANDY CLAY with interbedded sand seams

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.018246	0.0013	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	17.87016	0.0312	16.9	0.0299	0.5	6.453	2.6	2.6
2	00:01:00	46.48385	0.0616	45.5	0.0603	1.1	6.488	7.1	7.0
3	00:01:30	81.16108	0.0907	80.1	0.0894	1.6	6.522	12.5	12.3
4	00:02:00	100.9157	0.1209	99.9	0.1196	2.1	6.557	15.6	15.2
5	00:02:30	82.47681	0.1515	81.5	0.1502	2.6	6.593	12.7	12.4
6	00:03:00	66.9822	0.1812	66.0	0.1799	3.1	6.628	10.3	10.0
7	00:03:14	60.18478	0.1957	59.2	0.1944	3.4	6.645	9.2	8.9

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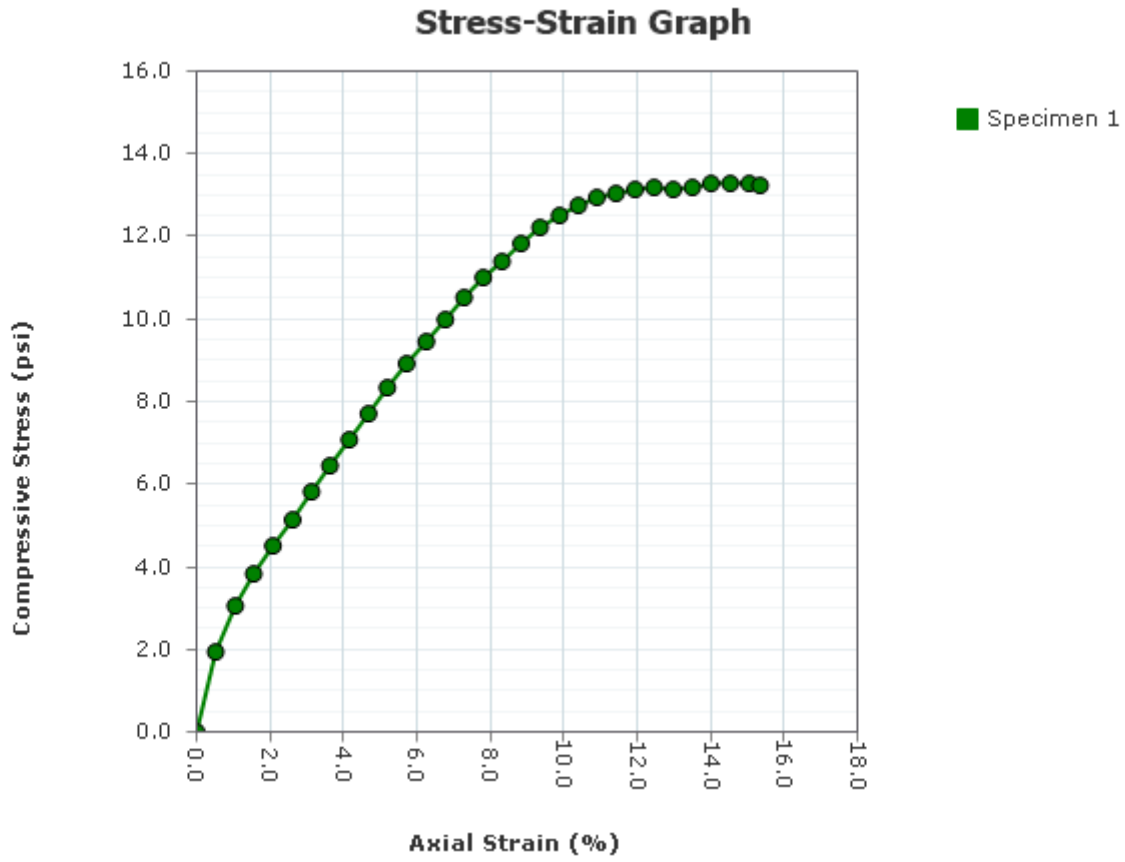
Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-3
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	18.4							
Wet Density (pcf)	130.9							
Dry Density (pcf)	110.6							
Saturation (%):	96.7							
Void Ratio:	0.507							
Height (in)	5.7485							
Diameter (in)	2.8287							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.03							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	13.3							
Undrained Shear Strength (psi)	6.6							
Strain at Failure (%):	15.0							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-3
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SANDY CLAY

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.00184	0.0005	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	13.21313	0.0303	12.2	0.0297	0.5	6.317	1.9	1.9
2	00:01:00	20.26758	0.0609	19.3	0.0604	1.1	6.351	3.1	3.0
3	00:01:30	25.41568	0.0898	24.4	0.0893	1.6	6.383	3.9	3.8
4	00:02:00	29.84959	0.1200	28.8	0.1195	2.1	6.418	4.6	4.5
5	00:02:30	34.14131	0.1507	33.1	0.1502	2.6	6.453	5.3	5.1
6	00:03:00	38.59819	0.1804	37.6	0.1799	3.1	6.487	6.0	5.8
7	00:03:30	42.9785	0.2092	42.0	0.2087	3.6	6.521	6.7	6.4
8	00:04:00	47.39601	0.2395	46.4	0.2390	4.2	6.557	7.4	7.1
9	00:04:30	51.74679	0.2696	50.7	0.2691	4.7	6.593	8.1	7.7
10	00:05:00	56.14023	0.2991	55.1	0.2986	5.2	6.629	8.8	8.3
11	00:05:30	60.34555	0.3292	59.3	0.3287	5.7	6.665	9.4	8.9
12	00:06:00	64.37917	0.3601	63.4	0.3596	6.3	6.704	10.1	9.5
13	00:06:30	68.37669	0.3899	67.4	0.3894	6.8	6.741	10.7	10.0
14	00:07:00	72.1664	0.4192	71.2	0.4187	7.3	6.778	11.3	10.5
15	00:07:30	75.90689	0.4493	74.9	0.4487	7.8	6.816	11.9	11.0
16	00:08:00	79.25365	0.4786	78.3	0.4781	8.3	6.854	12.5	11.4
17	00:08:30	82.64525	0.5084	81.6	0.5079	8.8	6.893	13.0	11.8
18	00:09:00	85.61359	0.5381	84.6	0.5376	9.4	6.933	13.5	12.2
19	00:09:30	88.23193	0.5688	87.2	0.5683	9.9	6.974	13.9	12.5
20	00:10:00	90.45107	0.5982	89.4	0.5976	10.4	7.013	14.2	12.8
21	00:10:30	92.25898	0.6271	91.3	0.6265	10.9	7.053	14.5	12.9
22	00:11:00	93.5944	0.6571	92.6	0.6566	11.4	7.095	14.7	13.1
23	00:11:30	94.77123	0.6868	93.8	0.6863	11.9	7.136	14.9	13.1
24	00:12:00	95.63745	0.7167	94.6	0.7162	12.5	7.179	15.1	13.2
25	00:12:30	96.04869	0.7466	95.0	0.7461	13.0	7.222	15.1	13.2
26	00:13:00	96.94772	0.7766	95.9	0.7761	13.5	7.265	15.3	13.2
27	00:13:30	97.98893	0.8060	97.0	0.8054	14.0	7.308	15.4	13.3
28	00:14:00	98.78844	0.8361	97.8	0.8355	14.5	7.353	15.6	13.3
29	00:14:30	99.18217	0.8657	98.2	0.8651	15.0	7.398	15.6	13.3
30	00:14:47	99.35279	0.8827	98.4	0.8822	15.3	7.423	15.7	13.2

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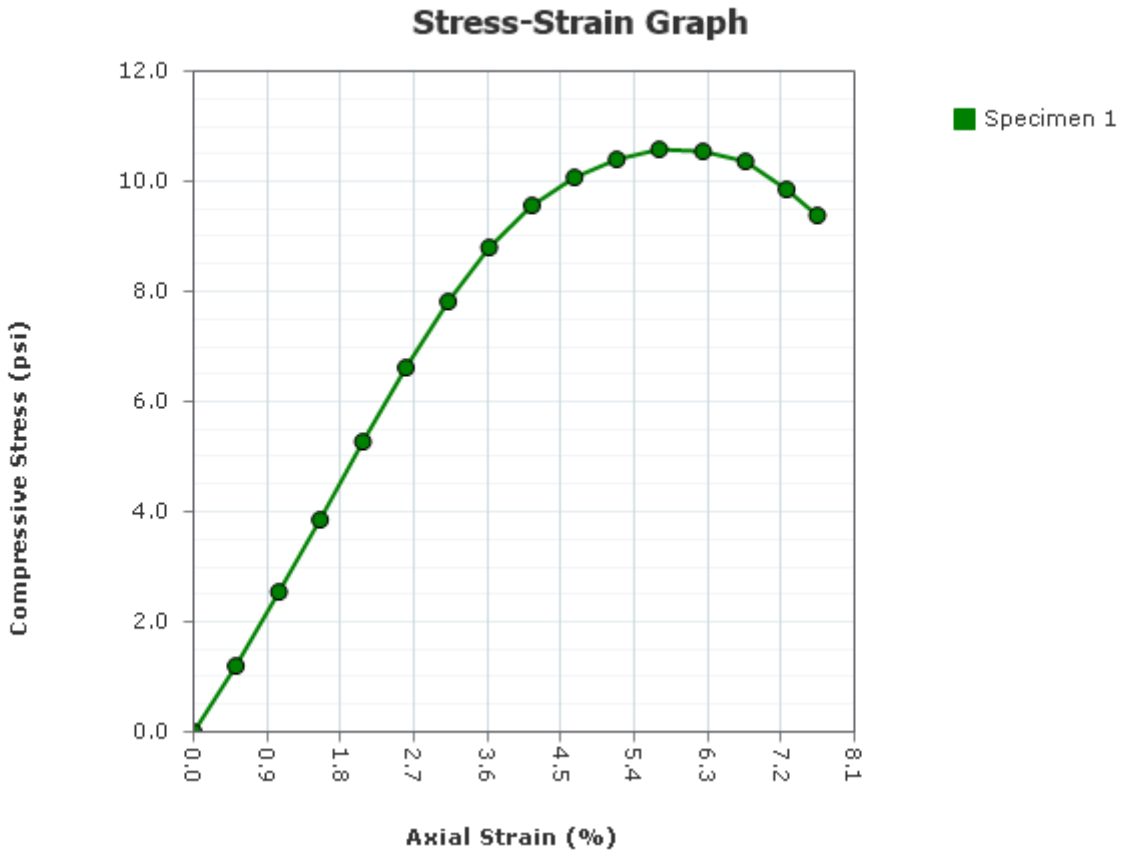
Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-4
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	16.2							
Wet Density (pcf)	130.4							
Dry Density (pcf)	112.2							
Saturation (%):	89.2							
Void Ratio:	0.485							
Height (in)	5.7492							
Diameter (in)	2.8580							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	10.5							
Undrained Shear Strength (psi)	5.3							
Strain at Failure (%):	6.2							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/7/2024
Sample Number:	S-2
Sample Depth:	3.0-5.0 ft
Boring Number:	B-4
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SANDY CLAY

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.012777	0.0010	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	8.751883	0.0307	7.7	0.0297	0.5	6.449	1.2	1.2
2	00:01:00	17.41408	0.0611	16.4	0.0601	1.0	6.483	2.6	2.5
3	00:01:30	26.23487	0.0900	25.2	0.0890	1.5	6.516	3.9	3.9
4	00:02:00	35.55986	0.1203	34.5	0.1192	2.1	6.551	5.4	5.3
5	00:02:30	44.6847	0.1506	43.7	0.1496	2.6	6.587	6.8	6.6
6	00:03:00	52.88644	0.1804	51.9	0.1793	3.1	6.622	8.1	7.8
7	00:03:30	59.65871	0.2093	58.6	0.2082	3.6	6.656	9.1	8.8
8	00:04:00	65.05508	0.2394	64.0	0.2384	4.1	6.693	10.0	9.6
9	00:04:30	68.83932	0.2694	67.8	0.2684	4.7	6.729	10.6	10.1
10	00:05:00	71.38548	0.2991	70.4	0.2981	5.2	6.766	11.0	10.4
11	00:05:30	72.89262	0.3291	71.9	0.3280	5.7	6.803	11.2	10.6
12	00:06:00	73.13324	0.3599	72.1	0.3588	6.2	6.842	11.2	10.5
13	00:06:30	72.29983	0.3898	71.3	0.3888	6.8	6.881	11.1	10.4
14	00:07:00	69.26806	0.4188	68.3	0.4178	7.3	6.918	10.6	9.9
15	00:07:21	66.27567	0.4405	65.3	0.4394	7.6	6.946	10.2	9.4

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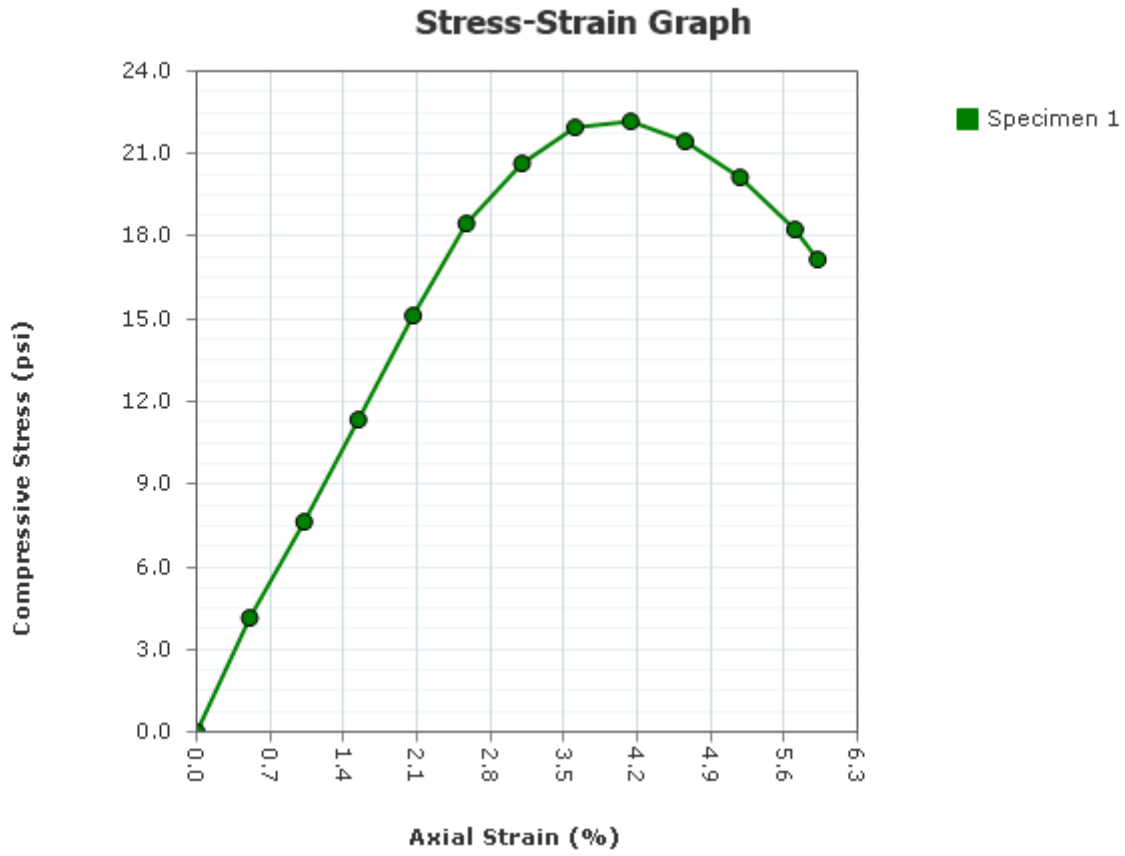
Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/2/2024
Sample Number:	S-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-6A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	17.2							
Wet Density (pcf)	131.4							
Dry Density (pcf)	112.2							
Saturation (%):	94.2							
Void Ratio:	0.486							
Height (in)	5.7392							
Diameter (in)	2.8623							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.05							
Unconfined Compressive Strength (psi)	22.2							
Undrained Shear Strength (psi)	11.1							
Strain at Failure (%):	4.1							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/2/2024
Sample Number:	S-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-6A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SANDY CLAY with trace gravel

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.017152	0.0003	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	27.93122	0.0293	26.9	0.0290	0.5	6.467	4.2	4.2
2	00:01:00	50.66511	0.0591	49.6	0.0588	1.0	6.501	7.7	7.6
3	00:01:30	75.00786	0.0887	74.0	0.0884	1.5	6.535	11.5	11.3
4	00:02:00	100.2124	0.1186	99.2	0.1184	2.1	6.570	15.4	15.1
5	00:02:30	122.9551	0.1478	121.9	0.1476	2.6	6.605	18.9	18.5
6	00:03:00	138.2966	0.1783	137.3	0.1780	3.1	6.641	21.3	20.7
7	00:03:30	147.4061	0.2073	146.4	0.2070	3.6	6.676	22.7	21.9
8	00:04:00	149.7926	0.2377	148.8	0.2375	4.1	6.712	23.1	22.2
9	00:04:30	145.7721	0.2675	144.8	0.2673	4.7	6.749	22.5	21.4
10	00:05:00	137.5463	0.2975	136.5	0.2973	5.2	6.786	21.2	20.1
11	00:05:30	125.5559	0.3276	124.5	0.3274	5.7	6.824	19.4	18.3
12	00:05:42	118.5321	0.3400	117.5	0.3397	5.9	6.840	18.3	17.2

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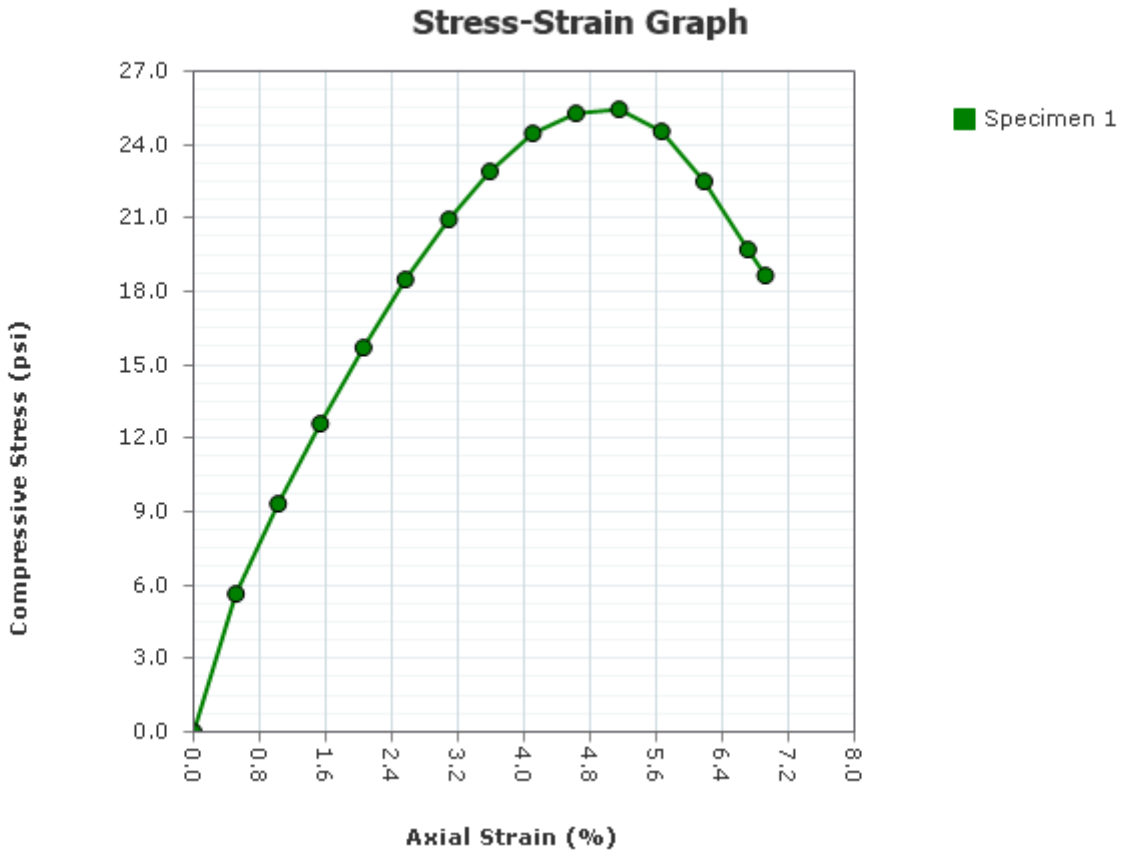
AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-7
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	18.4							
Wet Density (pcf)	128.7							
Dry Density (pcf)	108.8							
Saturation (%):	92.1							
Void Ratio:	0.533							
Height (in)	5.7907							
Diameter (in)	2.8880							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	25.4							
Undrained Shear Strength (psi)	12.7							
Strain at Failure (%):	5.1							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-7
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SANDY CLAY with trace gravel

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.036839	0.0003	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	38.06664	0.0298	37.0	0.0296	0.5	6.584	5.7	5.6
2	00:01:00	62.78344	0.0595	61.7	0.0592	1.0	6.618	9.4	9.3
3	00:01:30	84.71455	0.0890	83.7	0.0887	1.5	6.653	12.8	12.6
4	00:02:00	106.1874	0.1193	105.2	0.1190	2.1	6.688	16.1	15.7
5	00:02:30	125.6161	0.1487	124.6	0.1484	2.6	6.723	19.0	18.5
6	00:03:00	142.4319	0.1791	141.4	0.1788	3.1	6.759	21.6	20.9
7	00:03:30	156.8602	0.2079	155.8	0.2076	3.6	6.794	23.8	22.9
8	00:04:00	168.1604	0.2380	167.1	0.2377	4.1	6.831	25.5	24.5
9	00:04:30	174.8123	0.2683	173.8	0.2680	4.6	6.869	26.5	25.3
10	00:05:00	176.5776	0.2985	175.5	0.2982	5.1	6.906	26.8	25.4
11	00:05:30	171.5028	0.3283	170.5	0.3280	5.7	6.944	26.0	24.5
12	00:06:00	158.3728	0.3581	157.3	0.3579	6.2	6.982	24.0	22.5
13	00:06:30	139.5194	0.3888	138.5	0.3885	6.7	7.022	21.1	19.7
14	00:06:42	132.3085	0.4010	131.3	0.4007	6.9	7.038	20.0	18.7

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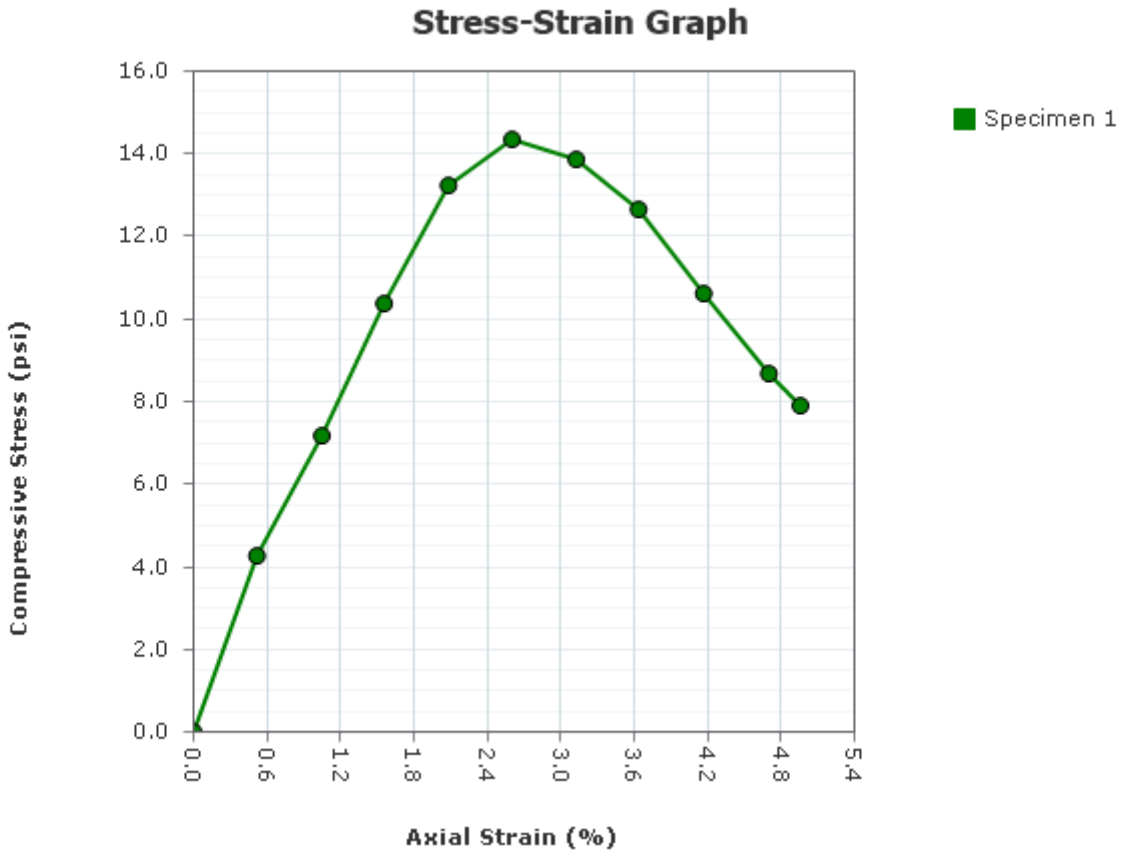
Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/2/2024
Sample Number:	S-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-9A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	17.8							
Wet Density (pcf)	132.9							
Dry Density (pcf)	112.9							
Saturation (%):	99.5							
Void Ratio:	0.477							
Height (in)	5.7208							
Diameter (in)	2.8513							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.05							
Unconfined Compressive Strength (psi)	14.3							
Undrained Shear Strength (psi)	7.2							
Strain at Failure (%):	2.6							

Specific Gravity:	2.7	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/2/2024
Sample Number:	S-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-9A
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:					
Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		
Specimen Description:	Brown and gray SANDY CLAY with trace gravel and interbedded sand seams				
Test Remarks:					

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.053245	0.0002	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	28.32823	0.0298	27.3	0.0296	0.5	6.419	4.3	4.2
2	00:01:00	47.21883	0.0602	46.2	0.0599	1.0	6.453	7.2	7.2
3	00:01:30	68.49261	0.0892	67.4	0.0890	1.6	6.486	10.6	10.4
4	00:02:00	87.43899	0.1193	86.4	0.1191	2.1	6.521	13.5	13.2
5	00:02:30	95.107	0.1490	94.1	0.1488	2.6	6.556	14.7	14.3
6	00:03:00	92.35085	0.1791	91.3	0.1788	3.1	6.591	14.3	13.9
7	00:03:30	85.00876	0.2082	84.0	0.2080	3.6	6.626	13.1	12.7
8	00:04:00	71.96078	0.2386	70.9	0.2384	4.2	6.663	11.1	10.6
9	00:04:30	59.18185	0.2691	58.1	0.2689	4.7	6.700	9.1	8.7
10	00:04:45	54.22186	0.2838	53.2	0.2836	5.0	6.718	8.3	7.9

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Unconfined Compression Test

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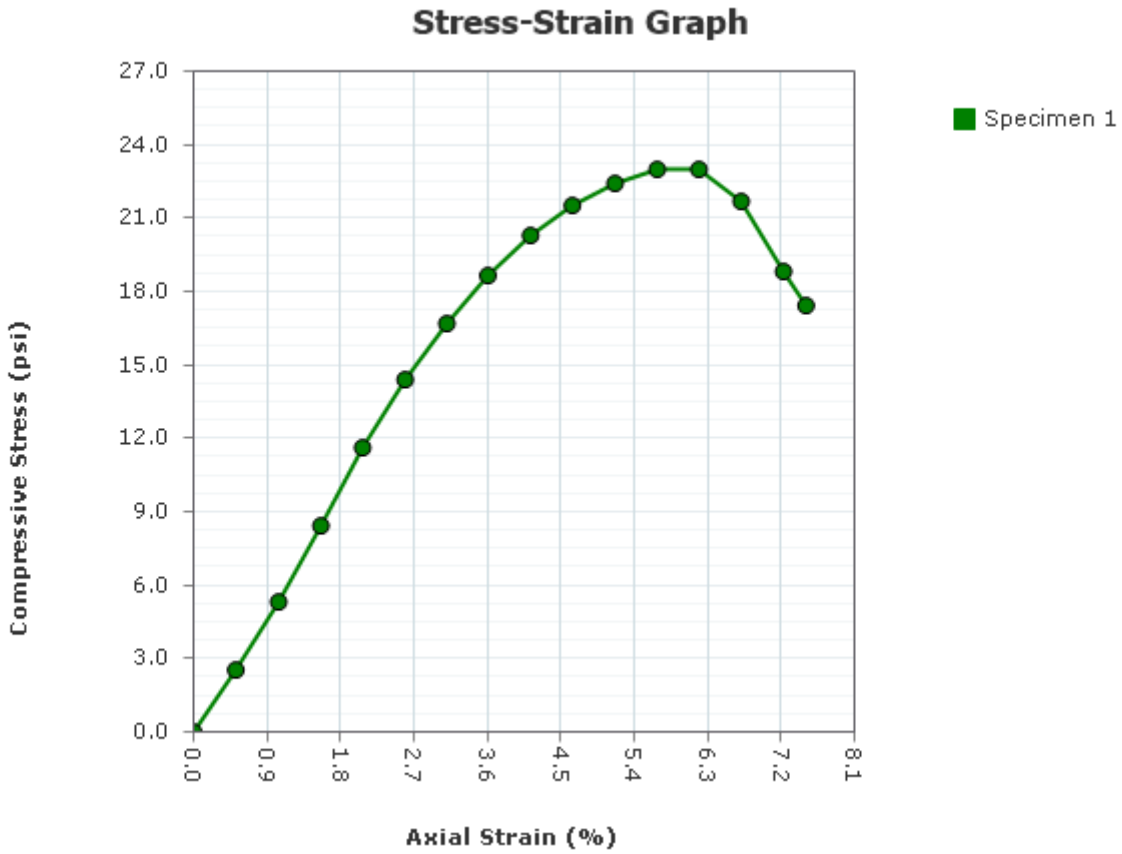

Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-11
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	19.4							
Wet Density (pcf)	126.5							
Dry Density (pcf)	105.9							
Saturation (%):	90.4							
Void Ratio:	0.574							
Height (in)	5.7768							
Diameter (in)	2.8730							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	23.0							
Undrained Shear Strength (psi)	11.5							
Strain at Failure (%):	6.2							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-11
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SILTY CLAY with little sand

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.017152	0.0004	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	17.31565	0.0302	16.3	0.0298	0.5	6.516	2.5	2.5
2	00:01:00	36.10234	0.0605	35.1	0.0602	1.0	6.551	5.4	5.4
3	00:01:30	56.71334	0.0904	55.7	0.0901	1.6	6.585	8.6	8.5
4	00:02:00	77.87229	0.1200	76.9	0.1196	2.1	6.620	11.9	11.6
5	00:02:30	96.73007	0.1501	95.7	0.1498	2.6	6.655	14.8	14.4
6	00:03:00	112.94	0.1796	111.9	0.1792	3.1	6.690	17.3	16.7
7	00:03:30	126.6311	0.2087	125.6	0.2083	3.6	6.725	19.4	18.7
8	00:04:00	138.1052	0.2389	137.1	0.2385	4.1	6.762	21.1	20.3
9	00:04:30	147.3788	0.2685	146.4	0.2682	4.6	6.798	22.6	21.5
10	00:05:00	154.2954	0.2987	153.3	0.2983	5.2	6.836	23.6	22.4
11	00:05:30	159.1416	0.3285	158.1	0.3282	5.7	6.873	24.4	23.0
12	00:06:00	159.8821	0.3581	158.9	0.3578	6.2	6.911	24.5	23.0
13	00:06:30	151.5677	0.3880	150.6	0.3876	6.7	6.949	23.2	21.7
14	00:07:00	132.7088	0.4180	131.7	0.4176	7.2	6.988	20.3	18.8
15	00:07:15	122.9474	0.4339	121.9	0.4336	7.5	7.009	18.8	17.4

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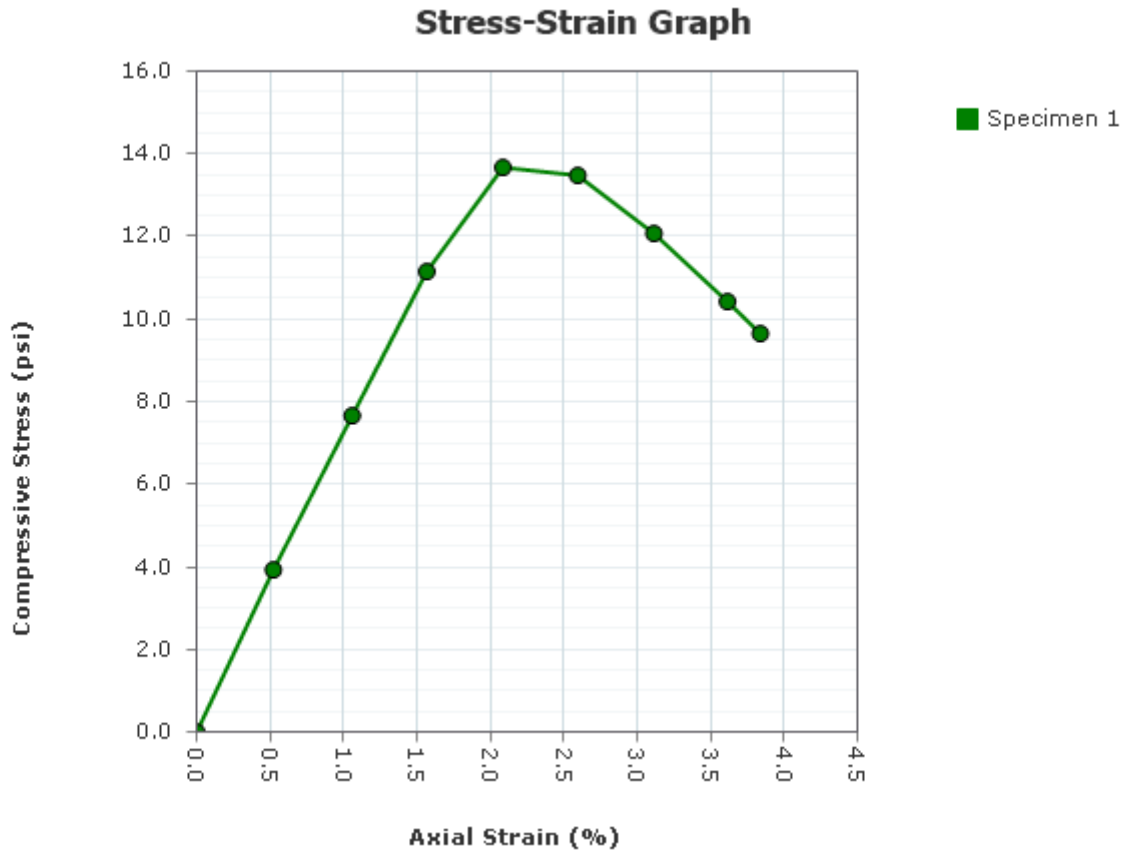
Unconfined Compression Test

ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-12
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	24.4							
Wet Density (pcf)	127.5							
Dry Density (pcf)	102.5							
Saturation (%):	100.0							
Void Ratio:	0.627							
Height (in)	5.7463							
Diameter (in)	2.8607							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	13.7							
Undrained Shear Strength (psi)	6.8							
Strain at Failure (%):	2.1							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/6/2024
Sample Number:	S-3
Sample Depth:	6.0-8.0 ft
Boring Number:	B-12
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

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Unconfined Compression Test

ASTM D2166

LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:

Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		

Specimen Description: Brown and gray SILTY CLAY with trace sand

Test Remarks:

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.01059	0.0006	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	26.50501	0.0306	25.5	0.0300	0.5	6.461	4.0	3.9
2	00:01:00	50.84339	0.0614	49.8	0.0608	1.1	6.496	7.8	7.7
3	00:01:30	73.88789	0.0906	72.9	0.0900	1.6	6.530	11.3	11.2
4	00:02:00	90.72121	0.1204	89.7	0.1198	2.1	6.564	14.0	13.7
5	00:02:30	90.10655	0.1497	89.1	0.1491	2.6	6.598	13.9	13.5
6	00:03:00	80.95328	0.1795	79.9	0.1789	3.1	6.634	12.4	12.1
7	00:03:30	70.62535	0.2082	69.6	0.2077	3.6	6.668	10.8	10.4
8	00:03:43	65.49913	0.2211	64.5	0.2206	3.8	6.684	10.0	9.6

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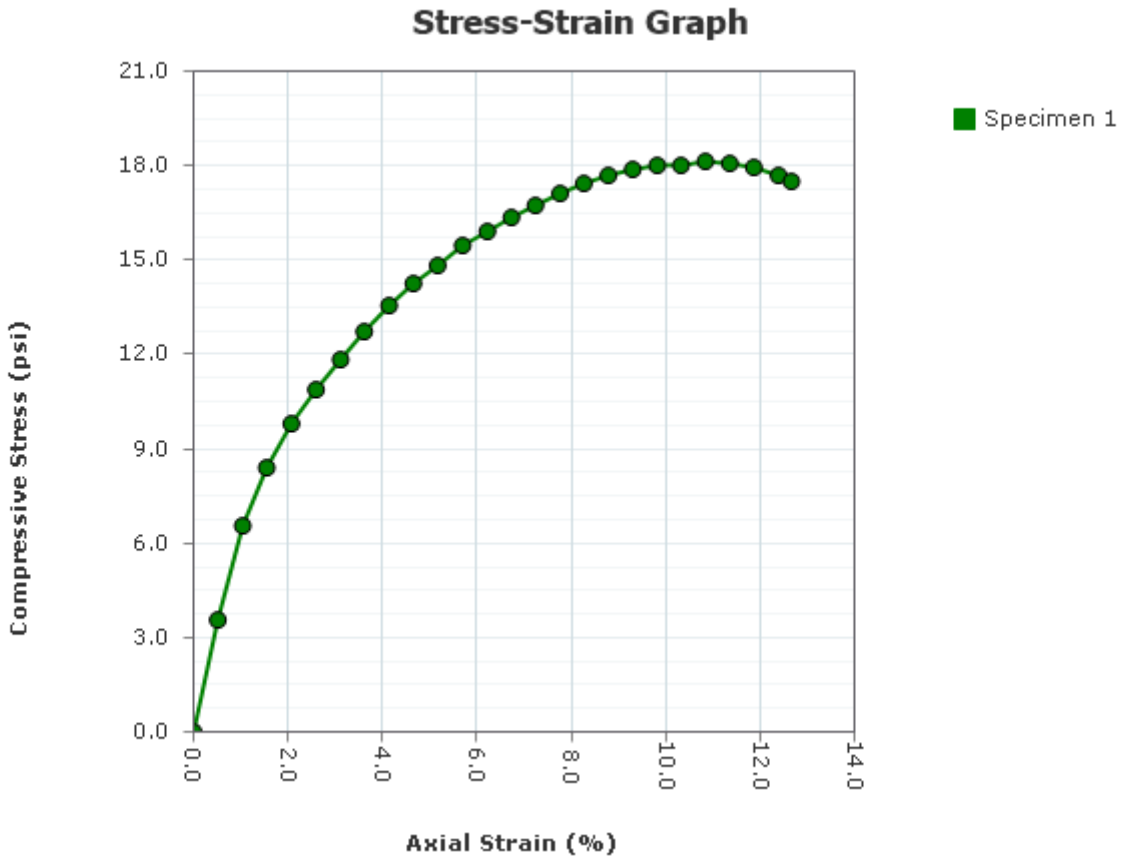
ASTM D2166



Project:	Westgate WWTP
Project Number:	24-0293-01G
Received Date:	5/13/2024
Sampling Date:	5/6/2024
Sample Number:	ST-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-14
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

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Unconfined Compression Test

ASTM D2166

Before Test	Specimen Number 1	2	3	4	5	6	7	8
Moisture Content (%):	20.0							
Wet Density (pcf)	130.3							
Dry Density (pcf)	108.5							
Saturation (%):	99.8							
Void Ratio:	0.536							
Height (in)	5.7627							
Diameter (in)	2.8823							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.00							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):								
Strain Rate (in/min)	0.06							
Strain Rate (%/min):	1.04							
Unconfined Compressive Strength (psi)	18.1							
Undrained Shear Strength (psi)	9.0							
Strain at Failure (%):	11.4							

Specific Gravity:	2.67	Plastic Limit:		Liquid Limit:	
Type:	Shelby Tube	Soil Classification:	CL		

Project:	Westgate WWTP
Project Number:	24-0293-01G
Sampling Date:	5/6/2024
Sample Number:	ST-1
Sample Depth:	6.0-8.0 ft
Boring Number:	B-14
Location:	
Client Name:	American Structurepoint, Inc.
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Patriot Engineering and Environmental, Inc.
6150 E 75th Street
Indianapolis, IN 46250
317-576-8058

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

AASHTO ACCREDITATION PROGRAM

Unconfined Compression Test

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LIMS Code: [TO COME FROM LIMS]

Specimen 1

Other Associated Tests:					
Sampling Method:	Intact	Material Moisture:	Trimmings	Source Moisture:	Before Shear
Molding Date:	5/29/2024	Test Date:	5/29/2024		
Large Particle:	NO	Sensitivity:	0		
Technician:	C. Moreno	Test Time:	5/29/2024		
Specimen Description:	Brown and gray SANDY CLAY with trace gravel and interbedded sand seams				
Test Remarks:					

Unconfined Compression Test - Specimen 1

ASTM D2166 LIMS Specimen Code: [TO COME FROM LIMS]

Index	Elapsed Time (hh:mm:ss)	Load (Lbf)	Displacement (in)	Corrected Load (Lbf)	Corrected Displacement (in)	Axial Strain (%)	Cross Sectional Area (in²)	Stress (psi)	Compressive Stress (psi)
0	00:00:00	1.00184	0.0005	0.0	0.0000	0.0	0.000	0.0	0.0
1	00:00:30	24.369	0.0300	23.4	0.0295	0.5	6.559	3.6	3.6
2	00:01:00	44.30846	0.0603	43.3	0.0599	1.0	6.593	6.6	6.6
3	00:01:30	56.88177	0.0896	55.9	0.0892	1.5	6.628	8.6	8.4
4	00:02:00	66.13457	0.1198	65.1	0.1193	2.1	6.663	10.0	9.8
5	00:02:30	73.84087	0.1498	72.8	0.1493	2.6	6.699	11.2	10.9
6	00:03:00	80.77172	0.1797	79.8	0.1793	3.1	6.734	12.2	11.8
7	00:03:30	87.24431	0.2086	86.2	0.2082	3.6	6.769	13.2	12.7
8	00:04:00	93.1416	0.2391	92.1	0.2386	4.1	6.807	14.1	13.5
9	00:04:30	98.46033	0.2687	97.5	0.2682	4.7	6.843	14.9	14.2
10	00:05:00	103.218	0.2984	102.2	0.2979	5.2	6.881	15.7	14.9
11	00:05:30	107.8422	0.3287	106.8	0.3283	5.7	6.919	16.4	15.4
12	00:06:00	111.6297	0.3589	110.6	0.3585	6.2	6.958	17.0	15.9
13	00:06:30	115.3111	0.3883	114.3	0.3878	6.7	6.996	17.5	16.3
14	00:07:00	118.7815	0.4176	117.8	0.4171	7.2	7.034	18.1	16.7
15	00:07:30	122.09	0.4478	121.1	0.4474	7.8	7.074	18.6	17.1
16	00:08:00	124.9194	0.4768	123.9	0.4763	8.3	7.113	19.0	17.4
17	00:08:30	127.5257	0.5067	126.5	0.5062	8.8	7.153	19.4	17.7
18	00:09:00	129.7974	0.5364	128.8	0.5360	9.3	7.194	19.7	17.9
19	00:09:30	131.1721	0.5664	130.2	0.5659	9.8	7.236	19.9	18.0
20	00:10:00	132.069	0.5954	131.1	0.5949	10.3	7.276	20.1	18.0
21	00:10:30	133.5083	0.6251	132.5	0.6247	10.8	7.318	20.3	18.1
22	00:11:00	133.9721	0.6549	133.0	0.6545	11.4	7.361	20.4	18.1
23	00:11:30	133.7949	0.6844	132.8	0.6839	11.9	7.404	20.4	17.9
24	00:12:00	132.7788	0.7144	131.8	0.7140	12.4	7.448	20.2	17.7
25	00:12:15	131.7496	0.7302	130.7	0.7297	12.7	7.471	20.0	17.5

APPENDIX C

GENERAL QUALIFICATIONS

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

GENERAL QUALIFICATIONS

of Patriot Engineering's Geotechnical Engineering Investigation

This report has been prepared at the request of our client for his use on this project. Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

This report may not contain sufficient information for purposes of other parties or other uses. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report. Should there be any significant differences in structural arrangement, loading or location of the structure, our analysis should be reviewed.

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. The analysis, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our exploration. Subsurface conditions at other locations may differ from those occurring at the specific drill sites. The nature and extent of variations between borings may not become evident until the time of construction. If, after performing on-site observations during construction and noting the characteristics of any variation, substantially different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We urge that Patriot be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations. In addition, we are available to observe construction, particularly the compaction of structural backfill and preparation of the foundations, and such other field observations as may be necessary.

In order to fairly consider changed or unexpected conditions that might arise during construction, we recommend the following verbiage (Standard Clause for Unanticipated Subsurface Conditions) be included in the project contract.

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

"The owner has had a subsurface exploration performed by a soils consultant, the results of which are contained in the consultant's report. The consultant's report presents his conclusions on the subsurface conditions based on his interpretation of the data obtained in the exploration. The contractor acknowledges that he has reviewed the consultant's report and any addenda thereto, and that his bid for earthwork operations is based on the subsurface conditions as described in that report. It is recognized that a subsurface exploration may not disclose all conditions as they actually exist and further, conditions may change, particularly groundwater conditions, between the time of a subsurface exploration and the time of earthwork operations. In recognition of these facts, this clause is entered in the contract to provide a means of equitable additional compensation for the contractor if adverse unanticipated conditions are encountered and to provide a means of rebate to the owner if the conditions are more favorable than anticipated.

At any time during construction operations that the contractor encounters conditions that are different than those anticipated by the soils consultant's report, he shall immediately (within 24 hours) bring this fact to the owner's attention. If the owner's representative on the construction site observes subsurface conditions which are different than those anticipated by the consultant's report, he shall immediately (within 24 hours) bring this fact to the contractor's attention. Once a fact of unanticipated conditions has been brought to the attention of either the owner or the contractor, and the consultant has concurred, immediate negotiations will be undertaken between the owner and the contractor to arrive at a change in contract price for additional work or reduction in work because of the unanticipated conditions. The contract agrees that the following unit prices would apply for additional or reduced work under the contract. For changed conditions for which unit prices are not provided, the additional work shall be paid for on a time and materials basis."

Another example of a changed conditions clause can be found in paper No. 4035 by Robert F. Borg, published in ASCE Construction Division Journal, No. CO2, September 1964, page 37.