LANCER ASSOCIATES ARCHITECTURE

ADDENDUM NO. ONE

PROJECT: **Johnson County Recycling Center**

PROJECT NUMBER: **23122**

DATE OF ADDENDUM: **May 19, 2024**

JERRY L. CRIPPS
NO. 880133

THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND IS ISSUED IN ACCORDANCE WITH THE INSTRUCTIONS TO BIDDERS. ACKNOWLEDGE RECEIPT OF THIS ADDENDUM BY SIGNING THE ADDDENDUM ACKNOWLEDGMENT SECTION OF THE BID FORM.

SPECIFICATIONS

1. Add Geotechnical Report to Spec Section 00 31 32 Information Available to Bidders (see attached)

Attachments: Geotechnical Report

End of Addendum 1

REPORT OF GEOTECHNICAL ENGINEERING EXPLORATION

JOHNSON COUNTY RECYCLE CENTER
FRANKLIN, INDIANA

PREPARED FOR:

LANCER ASSOCIATES
145 NORTH EAST STREET
INDIANAOPLIS, INDIANA 46204

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

May 9, 2024

PATRIOT
ENGINEERING AND ENVIRONMENTAL, INC.

May 9, 2024

Ms. Melissa Miller
Lancer Associates
145 North East Street
Indianapolis, Indiana 46204

Re: Report of Geotechnical Engineering Exploration
Johnson County Recycle Center
County Road 250 East
Franklin, Indiana
Patriot Project No.: 24-0566-01G

Dear Melissa:

Attached is the report of our geotechnical engineering exploration for the above referenced project. This exploration was completed in general accordance with our Proposal No. P24-0734-01G dated March 28, 2024.

This report includes graphic logs of twelve (12) soil borings drilled at the proposed project site. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and geotechnical recommendations pertinent to the site development, foundation design, and construction.

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 any questions regarding this report or if we may be of any additional assistance regarding any geotechnical aspect of the project, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.

Ian Grafe

Ian Grafe, E.I.
Geotechnical Engineer

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REPORT OF GEOTECHNICAL ENGINEERING EXPLORATION

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana
Patriot Project No.: 24-0566-01G

1.0 INTRODUCTION

1.1 General

Lancer Associates is planning the construction of a recycling facility to be located along County Road 250 East in Franklin, Indiana. The results of our geotechnical engineering exploration for the project are presented in this report.

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 structure. 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, geotechnical engineering interpretation of these results with respect to the available project information, and recommendations to aid in the design and construction of the proposed structure.

2.0 PROJECT INFORMATION

The proposed project is located along County Road 250 East in Franklin, Indiana. The project consists of a high single-story structure of slab-on-grade construction, approximately 165 feet by 60 feet in plan dimension, with adjacent parking and roadway areas. Additionally, we understand that a storm-water management area will be associated with the project and located on the western side of the property.

Based on information provided by Lynch, Harrison, and Brumleve, Inc., we understand that the proposed structure will have wall loads not exceeding 1,500 pounds per lineal feet (plf), isolated column loads not exceeding 125 kips, and that floor loads will not exceed 150 pounds per square foot (psf). Additionally, based on visual observations of the existing site, it is assumed that any grade raise fill to complete the construction of building pads, finished pavement subgrades, etc., will not exceed 2 feet above the existing ground surface.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The project site is presently an agricultural field. The surrounding area is generally an area of commercial development and agricultural fields. The topography in the area proposed for construction is generally flat.

3.2 General Subsurface Conditions

Our interpretation of the subsurface conditions is based upon twelve (12) soil borings drilled at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". All depths discussed below refer to depths below the existing ground surface. Based on the results of the soil borings completed at the site, the following subsurface profile is presented. A description of each general soil unit has been identified and is described below:

<u>Topsoil</u> – Topsoil, a surficial layer of material that is a blend of silts, sands, and clays, with varying amounts of organic matter, was encountered at the ground surface at the boring locations. The topsoil layer was about 7 to 8 inches thick in the borings.

<u>Silty and/or Sandy Clay (CL)</u> - The topsoil layer is generally underlain by very soft to stiff, silty and/or sandy clay. The silty and/or sandy clay layers typically extend to depths of 3.5 to 6 feet below the existing ground surface. The natural moisture content of this material ranges from 17 to 32 percent (%). The silty and/or sandy clay layers have hand penetrometer values of 0.5 to 2.2 tons per square foot (tsf). Standard Penetration Test N-values (blow counts) in this material varied from 0 to 9 blows per foot (bpf).

<u>Sand (SP-SM)</u> – Below the silty and/or sandy clay layers, medium dense to dense sand was generally encountered from 4 to the termination of the borings at 20 feet below existing grade. Standard Penetration Test N-values in this sand varied from 13 to 45 bpf.

<u>Silty Sand (SM)</u> - Within the silty and/or sandy clay and sand layers, loose to medium dense, silty sand was encountered between 0 to 13.5 feet below existing grade. Standard Penetration Test N-values in this silty sand varied from 6 to 24 bpf.

<u>Clayey Sand (SC)</u> - Within the silty and/or sandy clay and sand layers, loose to medium dense, clayey sand was encountered between 3.5 to 8.5 feet below existing grade in

Borings B-3 and B-5. Standard Penetration Test N-values in this clayey sand varied from 7 to 23 bpf.

Silty and/or Sandy Clay (CL) - The sand layers are underlain by medium stiff to hard, silty and/or sandy clay. The silty and/or sandy clay layers was encountered from depths of 6 to 20 feet below the existing ground surface in six (6) of the soil borings. The natural moisture content of this material ranges from 8 to 13 percent (%). The silty and/or sandy clay layers have hand penetrometer values of 1.9 to greater than 6 tons per square foot (tsf). Standard Penetration Test N-values (blow counts) in this material varied from 11 to more than 50 bpf.

As previously mentioned, unsuitable very soft clays were encountered in three (3) of the twelve (12) borings, at depths up to 6 feet below the existing ground surface. The following table presents the extent of the unsuitable soils encountered in the borings:

Table No. 1: Summary of Unsuitable Soils Encountered in Borings

Boring Number	Soil Classification	Approximate Depth of Unsuitable Soils (feet)(1)
B-1	Very Soft Silty Clay (CL)	3.5 to 6
B-3	Very Soft Silty Clay (CL)	0 to 4
B-6	Very Soft Sandy Clay (CL)	3.5 to 6

(1) Represents depth below existing ground surface.

The soil conditions described above are general, and some variations in the descriptions should be expected; for more specific information, please refer to the boring logs presented in Appendix “A”. It should be noted that 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.

3.3 Groundwater Conditions

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.

Groundwater was observed during drilling in the soil borings performed at the site at depths between 7 and 13 feet below the existing ground surface. Groundwater was not observed in the remaining borings during drilling. Immediately after the borings were completed and the augers were removed from the boreholes, groundwater was observed at depths between 3 and 5 feet below the existing ground surface in eleven (11) of the twelve (12) soil borings. The remaining boring was dry at the cave-in depth shown on the boring log.

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.***

4.0 DESIGN RECOMMENDATIONS

4.1 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.

4.2 Foundations

As previously mentioned, very soft clay was encountered in some of the borings from a depth of about 0 to 6 feet below existing grade. ***If soft clays, very loose sands, existing fill materials, or other unsuitable materials are encountered at the footing level or below, they must be undercut and replaced with well-compacted and tested structural fill prior to construction of foundations or the footings can be extended to suitable natural soils.*** Following the excavation of the footing areas, the foundations subgrade should be visually observed and probed by a *Patriot* representative at the direction of a geotechnical engineer at multiple locations at isolated footings and at every 10 feet (maximum) along wall footings to a depth of 3 to 5 feet. Any unsuitable soils encountered at the footing subgrade or below should be removed and replaced with well-compacted and tested structural fill.

Provided the above recommendations are followed, the proposed structure can be supported on spread footings bearing on the native undisturbed medium stiff to stiff clays or loose to medium dense sands encountered at shallow depths or on new well-compacted and tested structural fill overlying the same. These footings should be proportioned using a net allowable soil bearing pressure not exceeding 1,500 pounds per square foot (psf) for column footings or 1,200 psf for wall (strip) footings. 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 5.0 *“Construction Considerations”*.

Alternatively, the foundations may be designed to bear in the medium dense sands encountered at a depth of 6 feet using a net maximum allowable soil bearing pressure not exceeding 3,000 psf for the footings. However, 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.

We estimate that the total foundation settlement should not exceed approximately 1 inch and that differential settlement should not exceed about ¾ inch. Careful field control during construction is necessary to minimize the actual settlement that will occur.

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.

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. However, 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.

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 <u>during</u> construction and <u>after</u> construction is complete.

4.3 Floor Slabs

The near surface or shallow subgrade soils encountered within the proposed building footprint generally consist of medium stiff to stiff clays and loose to medium dense sands, which if properly prepared are suitable for floor slab support. ***However, very soft clays were encountered from 0 to 6 feet below the ground surface in some of the borings. Soft clays and other unsuitable materials must be removed and replaced with well-compacted structural fill.***

Depending on the weather conditions at the time of construction, scarifying and drying and/or chemical modification (Refer to Section 5.4 "Chemical Modification Considerations") may be necessary to manage moisture contents in the clays in order to achieve the necessary subgrade soil support prior to the placement of floor slabs or any grade raise fill.

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 the 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 5.0 *"Construction Considerations"*). 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.

4.4 Seismic Considerations

For structural design purposes, we recommend using a ***Site Classification of "C"*** as defined by the 2014 Indiana Building Code (modified 2012 International Building Code (IBC)). Furthermore, along with using a Site Classification of "C", we recommend the use of the maximum considered spectral response acceleration and design spectral response acceleration coefficients provided in Table No. 2 below. Refer to Appendix "B" for *"Seismic Site Class Evaluation"* report summary.

Table No. 2: 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 = 0.167 g	1.20	S_{DS} = 0.134 g
1.0	S_1 = 0.089 g	1.70	S_{D1} = 0.101 g

These values were obtained from the *"Earthquake Ground Motion Parameters"* program for seismic design, developed by the United States Geological Survey (USGS) Earthquake Hazard Program, utilizing latitude 39.5115° (degree) north and longitude 86.0563° (degree) west as the designation for identifying the location of the parcel. Other earthquake resistant design parameters should be applied consistent with the minimum requirements of the 2014 Indiana Building Code.

4.5 Pavements

The near surface or shallow subgrade soils encountered within the proposed pavement areas generally consist of medium stiff clays and loose to medium dense sands, which if properly prepared are suitable for pavement support. ***However, very soft clays were encountered from 0 to 6 feet below the ground surface in some of the borings. Soft clays and other unsuitable materials must be removed and replaced with well-compacted structural fill.***

If construction is performed during a wet or cold period, the contractor will need to exercise care during the grading and fill placement activities in order to achieve the

necessary subgrade soil support for the pavement section (Refer to Section 5.0 "Construction Considerations"). The base soil for the pavement section will need to be firm and dry. The subgrade should be sloped properly in order to provide good base drainage. To minimize the effects of groundwater or surface water conditions, the base section for the pavement system should be sufficiently high above adjacent ditches and properly graded to provide pavement surface and pavement base drainage.

Based upon the near surface soils encountered in the borings, we recommend using a California Bearing Ratio (CBR) value of 3 for the design of flexible (hot mix asphalt (HMA)) pavement sections. For design of rigid (concrete) pavement sections, we recommend using a modulus of subgrade reaction value of 75 pounds per cubic inch (pci). It should be recognized though, that the recommended CBR and modulus of subgrade reaction values provided are based on empirical relationships only, and laboratory tests may determine higher allowable values.

4.6 Storm-Water Management Basin

The soils encountered in the area of the proposed storm-water management basin (Borings P-1, P-2, and P-3) generally consist of sands which extend to depths of 15 feet below the existing ground surface. The sands are estimated to have relatively high permeability characteristics. Therefore, if a retention capacity is required for the detention pond, the pond will require the installation of a clay liner, and/or a synthetic liner. However, if percolation of water into the underlying soil is allowed and maintaining a long-term pond level is not a concern, a liner may not be required.

The soils encountered in our borings should be readily excavated using conventional earthwork equipment. ***Additionally, depending on the invert elevation of the proposed detention basin, sand layers and seams could be encountered which are expected to be free-flowing and will tend to readily cave and/or slough into excavations; therefore, over-excavation, benching and/or shoring should be expected in order to maintain the side slopes of the excavations.***

Depending on seasonal conditions and the invert elevation of the proposed detention basin, localized and sporadic groundwater infiltration should be expected to be encountered in the detention basin excavation (Refer to Section 5.5 *"Groundwater Considerations"*). Furthermore, it should also be noted that there may be the potential for encountering heaving of sand layers near the groundwater elevations during construction.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site 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.

Approximately seven (7) to eight (8) inches of loose surficial topsoil was encountered in the borings. The topsoil was measured at discrete locations as shown on the Boring Location Map (Figure No. 2) in 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 could 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. Additional field exploration by *Patriot* would be required to provide an accurate estimate of the stripping depth. This limited data indicates that a minimum stripping depth will be required to remove the organic material at the surface, followed by the potential for additional stripping and/or scarification and recompaction as may be required to achieve suitable subgrade support. ***Additionally, if saturated conditions exist with the surface soils, light tracked equipment could be required to avoid pushing organics deeper into the suitable subgrade soils.*** A *Patriot* representative should verify the stripping depth at the time grading operations occur.

Prior to construction of floor slabs, pavements or the placement of new structural fill, the exposed subgrade must be evaluated by a Patriot representative, which will include proofrolling of the subgrade. 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 in Section 5.3 *“Structural Fill and Fill Placement Control”*.

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 also 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.

5.2 Foundation Excavations

Excavation will 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 check the exposed subgrade to confirm that a bearing surface of adequate strength has been reached. 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 5.3 *"Structural Fill and Fill Placement Control"*.

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 (horizontal: vertical) 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 all requirements set-forth by the Occupational Safety and Health Standards (OSHA), but specifically Section 1926 Subpart "P" – *"Excavations"*. We recommend that any surcharge fill or heavy equipment be kept at least 5 feet away from the edge of the excavation.

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.

5.3 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 less than 40 and a plasticity index less than 20.***

All structural fill beneath floor slabs, adjacent to foundations and over foundations, should be compacted to at least 95 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 Section 4.0 *“Design Recommendations”*.

Structural fill supporting, around and over utilities should be compacted to at least 95 percent (%) 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 percent (%) 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.

In cut areas, where pavement sections are planned, the upper 10 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). Any grade-raise fill placed within 1 foot of the base of the pavement section should also be compacted to at least 100 percent (%) of the Standard Proctor maximum dry density. This can be reduced to 95 percent (%) for structural fill placed more than 1 foot below the base of the pavement section.

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 one (1) test every 10,000 square feet (ft^2) per lift for the parking and roadway areas, and at a frequency of at least one (1) test for every 50 lineal feet of utility installation*.**

5.4 Chemical Modification Considerations

The addition of lime or lime kiln dust (LKD) to clay soils of moderate to high plasticity generally results in the reduction of the plasticity properties of the soil, reduction in moisture holding capacity, swell reduction, and increased soil strength. Prior to the application of the lime or lime kiln dust (LKD), a number of representative samples of soils should be obtained from the final graded subgrade soils to determine the lime or lime kiln dust (LKD) reactivity and percentage (%) of lime or lime kiln dust (LKD) needed for modification of the soils (usually 5 to 8 percent (%)). A specialty contractor experienced in lime modification should apply and determine the rate at which hydrated lime or lime kiln dust (LKD) is mixed into the existing soils. Mixing depths of 12 to 18 inches is typical. A *Patriot* representative should monitor the mixing and compaction processes.

It should be noted that in areas where chemical modification of the natural subgrade soil is completed prior to the placement of grade raise fill and the grade raise fill is less than 18 inches in thickness, we recommend that any cohesive grade raise fill be modified similar to the natural subgrade. It has been our experience that untreated cohesive structural fill, in less than 18 inches in thickness, placed on top of chemically modified soil <u>may</u> become unstable over time due to excessive moisture accumulation. The underlying chemically modified soil <u>may</u> act as a barrier to natural water seepage into the soil profile, thereby trapping the water within the structural fill to the point of saturation.

5.5 Groundwater Considerations

Groundwater was observed during our field activities at depths between about 3 and 13 feet below the existing ground surface, which is expected to be near the anticipated foundation excavation depths, though the groundwater observations could potentially be within the anticipated storm-water management basin excavations and potentially within trench excavation depths for subsurface utilities. Therefore, groundwater infiltration should be expected into the storm-water management basins and subsurface utility excavations, and depending on seasonal conditions, localized and sporadic groundwater infiltration may occur into the building 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.

6.0 EXPLORATIONAL PROCEDURES

6.1 Field Work

A total of twelve (12) soil borings were drilled, sampled, and tested at the project site between April 18 and 19, 2024, at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix “A”. The depths that the soil borings were advanced to are shown on the Boring Logs in Appendix “A”. All depths are given as feet below the existing ground surface.

The borings were advanced using 3¼ inch 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 inch outside diameter by $1^3/_8$ inch inside diameter 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). 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 for safety considerations.

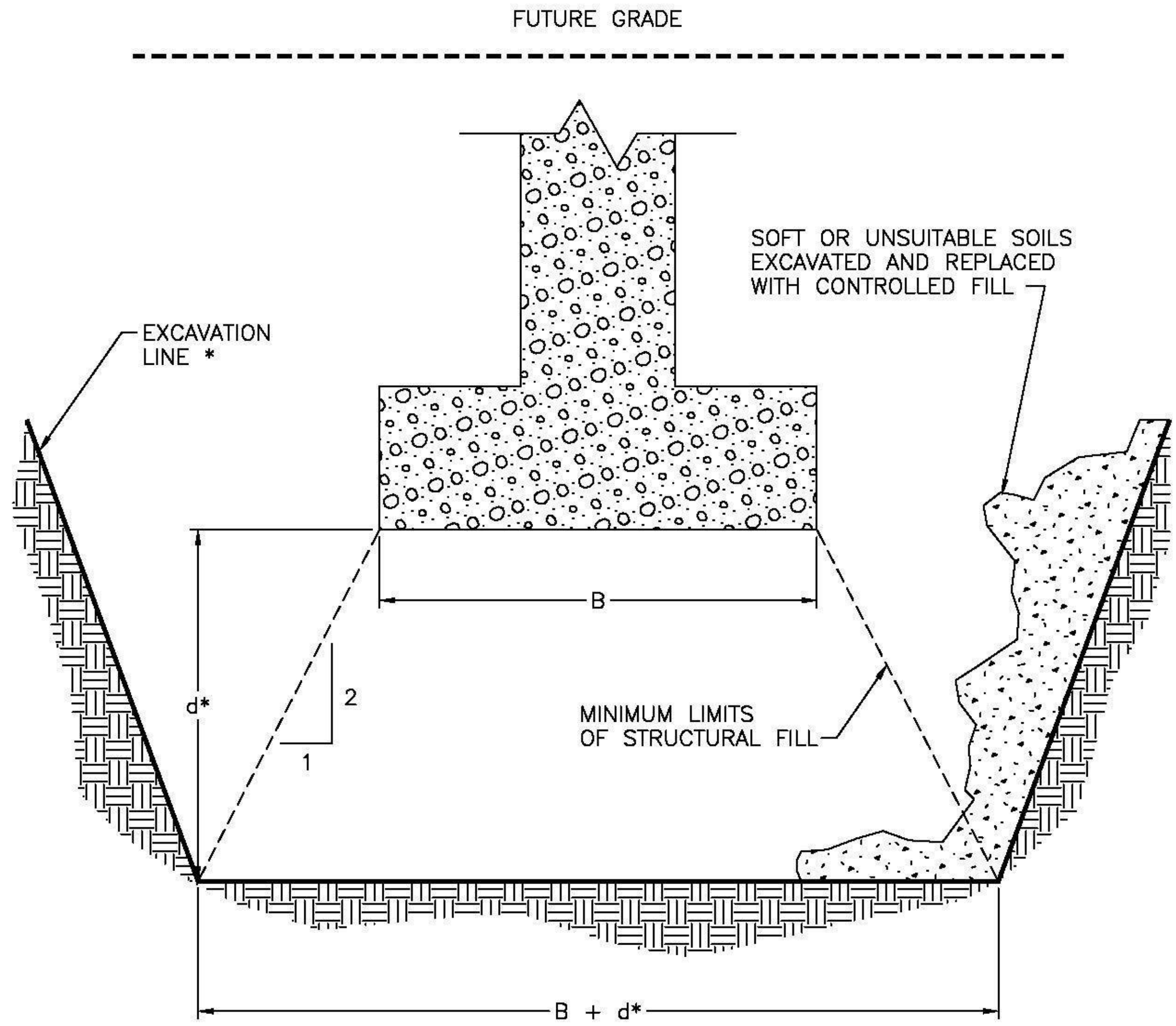
Upon completion of the boring program, of the samples retrieved during drilling were returned to *Patriot*'s soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and 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.

6.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis included natural moisture content determinations (ASTM D 2216) and an estimate of the cohesive soil strength was determined utilizing a hand penetrometer (q_p). The results of laboratory tests are summarized in Section 3.2 *"General Subsurface Conditions"*. Soil descriptions on the boring logs are in accordance with the Unified Soil Classification System (USCS).

7.0 ILLUSTRATIONS

See Illustrations "A" and "B" on the following pages. These illustrations are presented to further visually clarify several of the construction considerations presented in Section 5.2 *"Foundation Excavations"*.



*d IS DEPTH TO SUITABLE SOILS

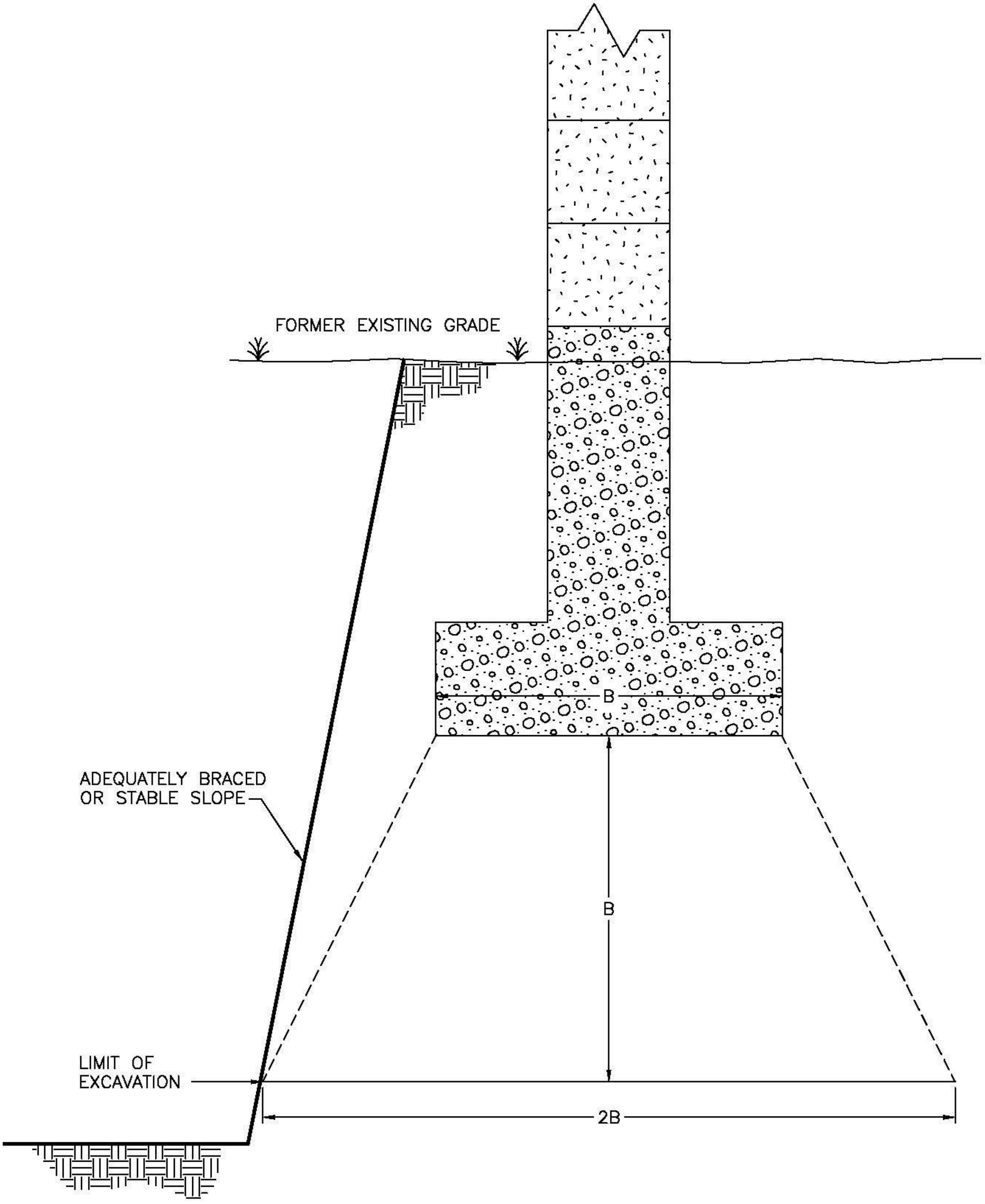
* IN COMPLIANCE WITH OSHA STANDARDS

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

Excavation for Footings In an Area of Fill
ILLUSTRATION A

job. no.:

figure:



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

Excavation Near Existing In Use Foundations
ILLUSTRATION B

job. no.:

figure:

APPENDIX A

SITE VICINITY MAP (FIGURE NO. 1)

BORING LOCATION MAP (FIGURE NO. 2)

BORING LOGS

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM
(USCS)

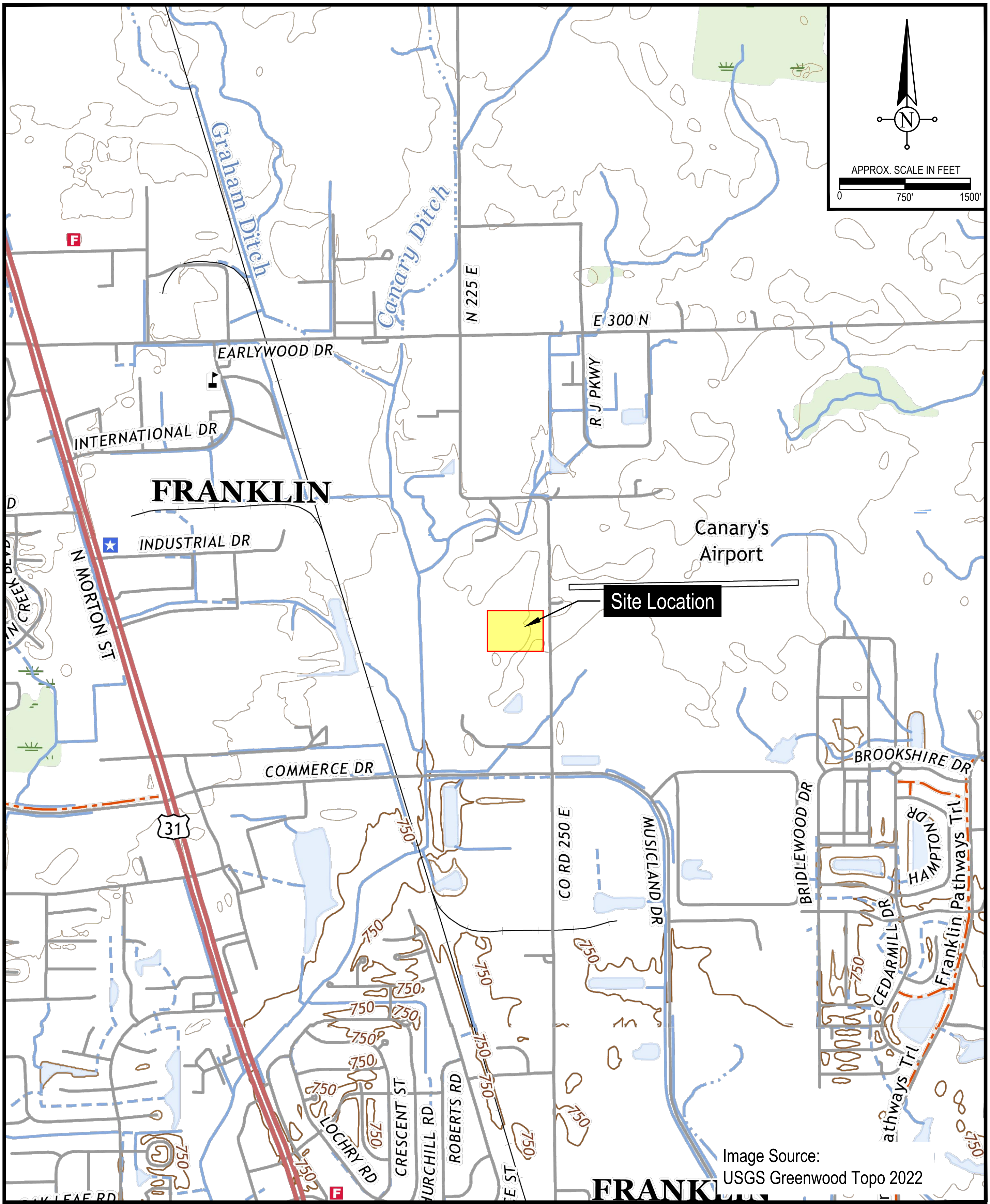


Image Source:
USGS Greenwood Topo 2022

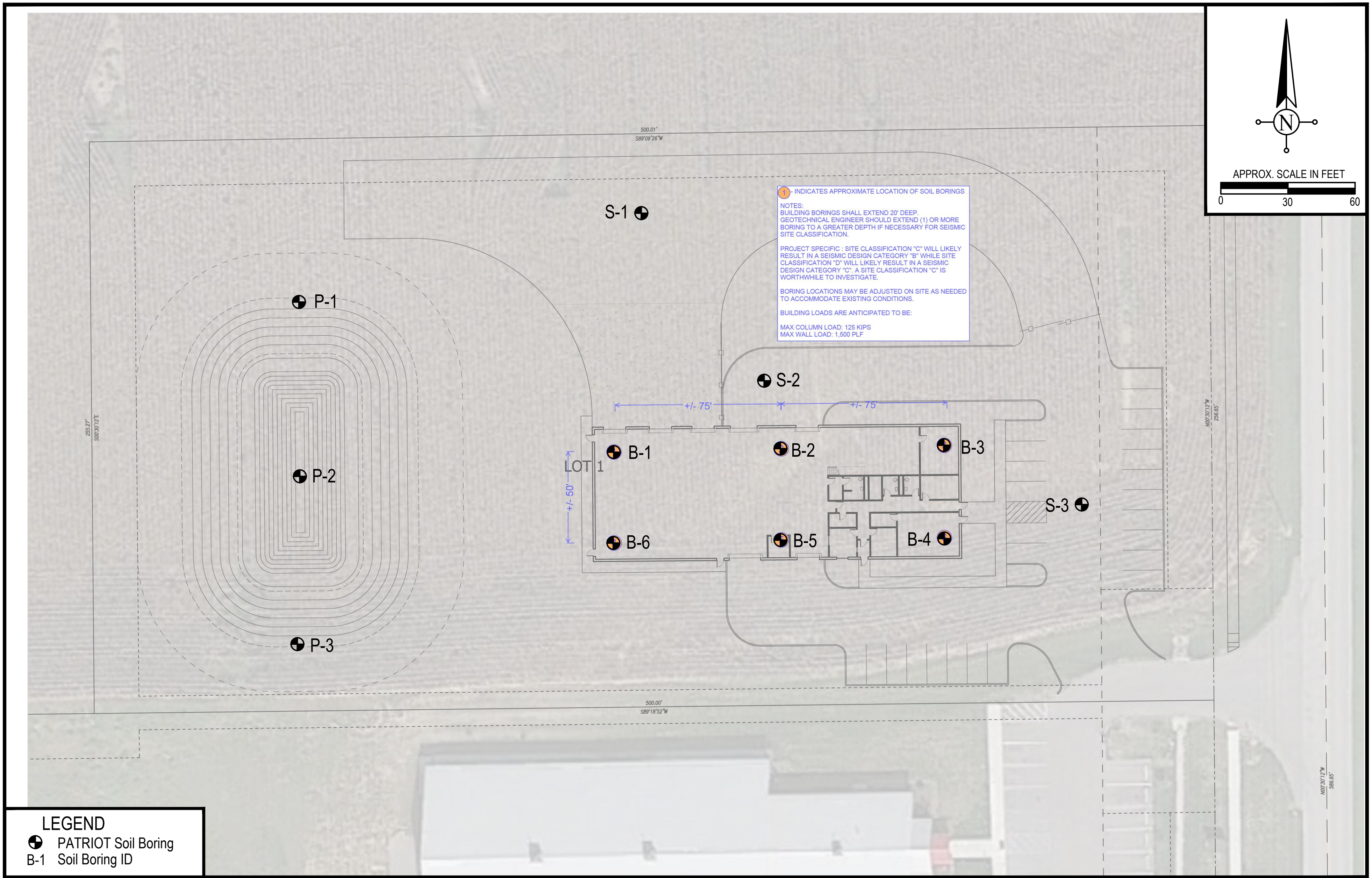
Patriot Engineering & Environmental, Inc.

Project: Johnson County Recycle Center
CR 250 East
Franklin, Indiana

Drawn By: J. DuMond
Project Number:24-0566-01
Approved: I. Grafe
Date: May 9, 2024
DWG: 24-0566-01_geo

Figure 1

Site Vicinity Map



① - INDICATES APPROXIMATE LOCATION OF SOIL BORINGS

NOTES:
BUILDING BORINGS SHALL EXTEND 20' DEEP.
GEOTECHNICAL ENGINEER SHOULD EXTEND (1) OR MORE BORING TO A GREATER DEPTH IF NECESSARY FOR SEISMIC SITE CLASSIFICATION.

PROJECT SPECIFIC : SITE CLASSIFICATION "C" WILL LIKELY RESULT IN A SEISMIC DESIGN CATEGORY "B" WHILE SITE CLASSIFICATION "D" WILL LIKELY RESULT IN A SEISMIC DESIGN CATEGORY "C". A SITE CLASSIFICATION "C" IS WORTHWHILE TO INVESTIGATE.

BORING LOCATIONS MAY BE ADJUSTED ON SITE AS NEEDED TO ACCOMMODATE EXISTING CONDITIONS.

BUILDING LOADS ARE ANTICIPATED TO BE:

MAX COLUMN LOAD: 125 KIPS
MAX WALL LOAD: 1,500 PLF

Patriot Engineering &
Environmental, Inc.

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: Crossroad Engineers
4. Scale as shown.

Project: Johnson County Recycle Center
CR 250 East
Franklin, Indiana

Project Number: 24-0566-01
Date: May 9, 2024
Drawn By: J. DuMond
Approved: I. Grafe
DWG: 24-0566-01_geo

Figure 2

Soil Boring Location Map

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LOG OF BORING B-1

(Page 1 of 1)

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 762 feet
Start Date	: 04/18/2024	Latitude	: 39°30'40.88"N
Drilling Method	: HSA	Longitude	: 86° 3'23.51"W

Water Levels
▼ During Drilling - 8.0 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 762	Water Level	USCS	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0				TOPSOIL (7")						
	760	▽	CL	Brown and gray, very moist, medium stiff, SILTY CLAY with trace sand	1	67	3/3/3	1.0	26	
5			CL	Brown and gray, very soft, SILTY CLAY with trace sand	2	0	W/O/H			WOH - Weight of Hammer Sample No. 2: Two attempts were made to obtain a splitspoon sample. Classification is based on field observations. Boring caved to 6.5 feet upon auger removal.
	755	▼	SP-SM	Brown, saturated, medium dense to dense, fine to medium grained, SAND with trace silt and little to trace gravel	3	67	6/6/7			
10					4	100	4/7/9			
	750									
15					5	100	12/26/19			
	745				6	100	9/16/23			
20										

Boring terminated at 20 feet.

Depth (Feet)	Elevation (Feet)
	740
25	

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LOG OF BORING B-2

(Page 1 of 1)

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name : Lynch, Harrison & Brumleve, Inc.
Project Number : 24-0566-01G
Logged By : D. Myers
Start Date : 04/18/2024
Drilling Method : HSA
Driller : M. Wagner
Sampling : Splitspoon
Approx. Elevation : +/- 762 feet
Latitude : 39°30'40.90"N
Longitude : 86° 3'22.55"W

Water Levels
▼ During Drilling - 6.0 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 762	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (7")						
5	760	▽ ▼	SM		Brown, slightly moist, medium dense, SILTY SAND	1 2	67 67	2/5/6 5/6/8			Boring caved to 5.5 feet upon auger removal.
10	755 750		SP-SM		Brown, saurated, medium dense, fine to medium grained, SAND with trace silt and some gravel	3 4	100 100	12/12/13 10/14/14			
15	745		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and little to some gravel	5	78	10/9/11			
20			CL		Gray, slightly moist, hard, SANDY CLAY with trace gravel	6	100	10/17/21	>6.0	8	
25	740				Boring terminated at 20 feet.						

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LOG OF BORING B-3

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 761 feet
Start Date	: 04/18/2024	Latitude	: 39°30'40.93"N
Drilling Method	: HSA	Longitude	: 86° 3'21.61"W

Water Levels
▼ During Drilling - 3.5 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 761	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
	760	▽ ▼	CL		Brown, moist, very soft, SANDY CLAY with trace gravel, trace plant matter, and interbedded sand seams	1	42	W/O/H	1.5	21	WOH - Weight of Hammer
5			SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and some gravel	2	42	WOH/12/12			
	755		SC		Brown, saturated, medium dense, CLAYEY SAND with trace gravel	3	56	9/11/12			Boring caved to 7.8 feet upon auger removal.
10 15	750 745		SP-ML		Brown, saturated, medium dense to dense, fine to medium grained, SAND with trace silt and trace gravel	4 5	100 67	8/8/11 11/16/17			
			CL		Gray, slightly moist, very stiff, SANDY CLAY with trace gravel	6	100	8/13/17	>6.0	9	
20 25	740				Boring terminated at 20 feet.						

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LOG OF BORING B-4

(Page 1 of 1)

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 760 feet
Start Date	: 04/18/2024	Latitude	: 39°30'40.48"N
Drilling Method	: HSA	Longitude	: 86° 3'21.61"W

Water Levels

▼ During Drilling - 3.5 feet

▽ After Completion - 3.0 feet

◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 760	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (7")						
		▽ ▼	SM		Brown, slightly moist, medium dense, SILTY SAND	1	44	6/7/8			Boring caved to 3 feet upon auger removal.
5	755		SM		Brown, saturated, medium dense, SILTY SAND	2	67	6/7/9			
			SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	3	67	4/9/8			
10 15	750 745		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt, little gravel, and interbedded clay seams	4 5	67 67	4/7/9 7/11/14			
20	740		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	42	8/18/15			
25	735				Boring terminated at 20 feet.						

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LOG OF BORING B-5

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name : Lynch, Harrison & Brumleve, Inc.
Project Number : 24-0566-01G
Logged By : D. Myers
Start Date : 04/18/2024
Drilling Method : HSA
Driller : M. Wagner
Sampling : Splitspoon
Approx. Elevation : +/- 761 feet
Latitude : 39°30'40.49"N
Longitude : 86° 3'22.54"W

Water Levels
▼ During Drilling - 6.0 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 761	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
	760	▽	CL		Brown, moist, medium stiff, SANDY CLAY with trace gravel	1	44	2/2/3	1.7	18	
5	755	▼	SC		Brown, slightly moist, loose, CLAYEY SAND with trace gravel	2	56	1/WOH/7			WOH - Weight of Hammer
			SP-SM		Brown,saturated, medium dense, fine to medium grained, SAND with trace silt and some gravel	3	67	7/8/8			
10	750		CL		Brown, slightly moist, stiff, SANDY CLAY with trace gravel and interbedded sand seams	4	100	6/8/5		13	Boring caved to 10 feet upon auger removal.
15	745		CL		Gray, slightly moist, stiff, SANDY CLAY with trace gravel	5	67	6/7/8	3.5	10	
						6	100	4/4/7	1.9	11	
20	740				Boring terminated at 20 feet.						
25											

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LOG OF BORING B-6

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 762 feet
Start Date	: 04/18/2024	Latitude	: 39°30'40.47"N
Drilling Method	: HSA	Longitude	: 86° 3'23.50"W

Water Levels
▼ During Drilling - 6.0 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 762	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0				▤	TOPSOIL (7")						
	760	▽	SM	░	Brown, slightly moist, loose,SILTY SAND with interbedded clay seams	1	100	3/3/4			
5		▼	CL	▨	Brown and gray, moist, very soft, SANDY CLAY	2	67	1/WOH/WOH	0.6	23	WOH - Weight of Hammer
	755		SP-SM	░	Brown, saturated, medium dense, fine to medium grained, SAND with trace silt, trace gravel, and interbedded clay seams	3	100	8/9/11			
10	750		SM	░	Brown, saturated, medium dense, SILTY SAND	4	67	5/7/9			Boring caved to 10.5 feet upon auger removal.
15	745		SP-SM	░	Brown, saturated, medium dense, fine to medium grained, SAND and gravel with trace silt	5	100	8/10/14			
			SP-SM	░	Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and little to some gravel	6	100	10/10/10			
20					Boring terminated at 20 feet.						
	740										
25											

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LOG OF BORING P-1

(Page 1 of 1)

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name : Lynch, Harrison & Brumleve, Inc.
Project Number : 24-0566-01G
Logged By : D. Myers
Start Date : 04/19/2024
Drilling Method : HSA
Driller : M. Wagner
Sampling : Splitspoon
Approx. Elevation : +/- 759 feet
Latitude : 39°30'41.61"N
Longitude : 86° 3'25.35"W

Water Levels
▼ During Drilling - 8.5 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - Dry

Depth (Feet)	Elevation (Feet) 759	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
		▽	CL		Gray, very moist, medium stiff, SILTY CLAY with little sand and interbedded sand seams	1	67	2/3/2	0.5	28	
5	755		SM		Gray, slightly moist, medium dense, SILTY SAND	2	67	6/5/6			Boring caved to 5 feet upon auger removal.
		▼	CL		Gray, slightly moist, very stiff, SANDY CLAY with trace gravel and interbedded sand seams	3	100	6/8/9	5.6	10	
10	750		SM		Gray, saturated, medium dense, SILTY SAND with interbedded clay seams	4	67	5/9/8			
	745		CL		Gray, slightly moist, very stiff, SANDY CLAY with trace gravel	5	100	6/11/11	>6.0	9	
15 20 25	740 735				Boring terminated at 15 feet.						

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LOG OF BORING P-2

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 759 feet
Start Date	: 04/19/2024	Latitude	: 39°30'40.81"N
Drilling Method	: HSA	Longitude	: 86° 3'25.28"W

Water Levels
▼ During Drilling - 8.5 feet
▽ After Completion - 3.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 759	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
		▽	CL		Gray and brown, very moist, medium stiff, SILTY CLAY with little to some sand	1	67	1/2/3	1.4	32	
5	755		CL		Gray and brown, moist, medium stiff, SANDY CLAY with interbedded sand seams	2	100	4/4/4		17	
		▼	SP-SM		Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt	3	100	7/14/15			Boring caved to 7.5 feet upon auger removal.
10	750		CL		Gray, slightly moist, very stiff, SANDY CLAY with trace gravel and interbedded silt seams	4	100	7/10/16	>6.0	10	
15	745		CL		Gray, slightly moist, hard, SANDY CLAY with trace gravel	5	100	10/12/21	>6.0	9	
20 25	740 735				Boring terminated at 15 feet.						

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LOG OF BORING P-3

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 761 feet
Start Date	: 04/19/2024	Latitude	: 39°30'40.01"N
Drilling Method	: HSA	Longitude	: 86° 3'25.30"W

Water Levels

▼ During Drilling - 8.0 feet

▽ After Completion - 4.0 feet

◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 761	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0				▤	TOPSOIL (8")						
	760		CL	▨	Brown and gray, moist, medium stiff, SILTY CLAY with little sand	1	100	1/3/4	1.5	20	
		▽	SM	░	Brown, slightly moist, medium dense to dense, SILTY SAND	2	100	4/5/7			
5	755					3	67	11/15/17			Boring caved to 5 feet upon auger removal.
		▼	SP-SM	░	Brown, saturated, medium dense, fine to medium grained, SAND with trace silt, trace gravel, and interbedded clay seams	4	67	11/14/16			
10	750										
			CL	▨	Gray, slightly moist, hard, SANDY CLAY with trace gravel and interbedded sand seams	5	100	15/32/36		8	
15	745				Boring terminated at 15 feet.						
20	740										
25											

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LOG OF BORING S-1

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 761 feet
Start Date	: 04/19/2024	Latitude	: 39°30'42.10"N
Drilling Method	: HSA	Longitude	: 86° 3'23.35"W

Water Levels

▼ During Drilling - 6.0 feet

▽ After Completion - 4.0 feet

◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 761	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
	760		CL		Brown and gray, very mosit, stiff, SILTY CLAY with trace sand	1	100	3/3/6	1.4	26	
5		▽	SM		Brown, slightly moist, loose, SILTY SAND	2	67	WOH/2/4			WOH - Weight of Hammer
	755	▼	SM		Brown, saturated, medium dense, SILTY SAND	3	100	6/11/12			Boring caved to 7 feet upon auger removal.
10						4	100	5/10/14			

Boring terminated at 10 feet.

Depth (Feet)	Elevation (Feet)
	750
15	
	745
20	
	740
25	

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LOG OF BORING S-2

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Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 762 feet
Start Date	: 04/19/2024	Latitude	: 39°30'41.27"N
Drilling Method	: HSA	Longitude	: 86° 3'22.88"W

Water Levels
▼ During Drilling - 8.0 feet
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 762	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (7")						
	760		CL		Brown and dark brown, moist, medium stiff, SILTY CLAY with trace to little sand	1	100	3/4/4	2.2	22	Boring caved to ??? feet upon auger removal.
5			CL		Brown and gray, very moist, medium stiff, SANDY CLAY with trace gravel	2	100	2/2/3	0.8	25	
	755	▼	SP-SM		Brown, slightly mosit, medium dense, fine to medium grained, SAND with trace silt and trace to little gravel	3	67	4/8/8			Note: Sample 3 looked very moist by apperance
10			SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND and gravel with trace silt	4	67	3/5/10			
	750				Boring terminated at 10 feet.						
15	745										
20	740										
25											

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LOG OF BORING S-3

(Page 1 of 1)

Johnson County Recycle Center
County Road 250 East
Franklin, Indiana

Client Name	: Lynch, Harrison & Brumleve, Inc.	Driller	: M. Wagner
Project Number	: 24-0566-01G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- 761 feet
Start Date	: 04/18/2024	Latitude	: 39°30'40.63"N
Drilling Method	: HSA	Longitude	: 86° 3'20.70"W

Water Levels
▼ During Drilling - 8.5 feet
▽ After Completion - 5.0 feet
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 761	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL (8")						
	760		SM		Brown, slightly moist, medium dense, SILTY SAND with trace gravel	1	44	7/6/8			
						2	67	4/8/12			
5		▽									Boring caved to 5 feet upon auger removal.
	755		SM		Brown, slightly moist, medium dense, SILTY SAND	3	67	8/10/12			
		▼	SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and little to some gravel	4	100	6/8/11			
10											
	750				Boring terminated at 10 feet.						
15	745										
20	740										
25											

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

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

Density	Field Identification (SPT Blows/ft)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 51

Grain Size Terminology

Soil Fraction		Particle Size	US Standard Sieve Size
Boulders		> 12 inches	> 12 inches
Cobbles		3 - 12 inches	3 - 12 inches
Gravel:	Coarse	¾ - 3 inches	¾ - 3 inches
	Small	4.76 mm - ¾ inch	No. 4 - ¾ inches
Sand:	Coarse	2.00 - 4.76 mm	No. 10 - No. 4
	Medium	0.42 - 2.00 mm	No. 40 - No. 10
	Fine	0.074 - 0.42 mm	No. 200 – No. 40
Silt		0.005 - 0.074 mm	< No. 200
Clay		< 0.005 mm	< No. 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/ft^2)	Field Identification (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: Provided on Boring Logs are made by visual inspection.

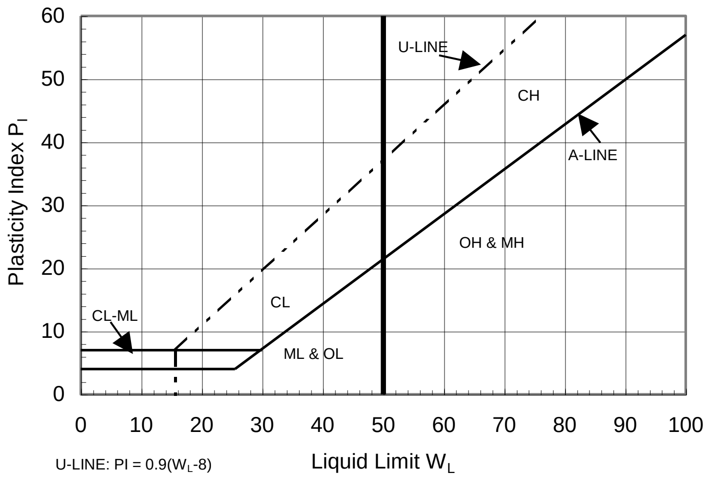
Standard Penetration Test: Driving a 2 inch outer-diameter (O.D.) by 1⅜ inch inner-diameter (I.D.) split-spoon sampler a total of 18 inches into undisturbed soil with the number of blows of a 140 pound hammer free-falling a distance of 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the "N"-value (or blow-count).

Strata Changes: In the column "Descriptions" on the Boring Logs the horizontal lines represent strata changes. A solid line (———) represents an observed change, a dashed line (- - - - - -) represents an estimated change.

Groundwater: Observations were made at the times indicated on the Boring Logs. Fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. *Groundwater symbols*: (▼)-observed groundwater level and/or elevation during drilling; (∇)-observed groundwater level and/or elevation upon completion of boring.

Unified Soil Classification System (USCS)

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 plasticity			
	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			



U-LINE: PI = 0.9(W_L-8)
A-LINE: PI = 0.73(W_L-20)

Plasticity Chart

APPENDIX B

SEISMIC SITE CLASS EVALUATION

⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

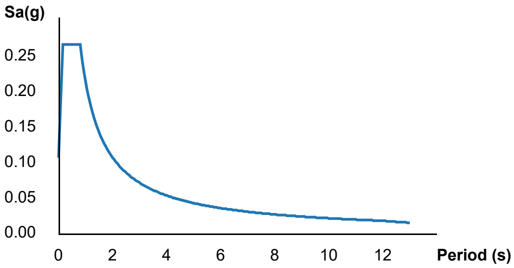
ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

ATC Hazards by Location

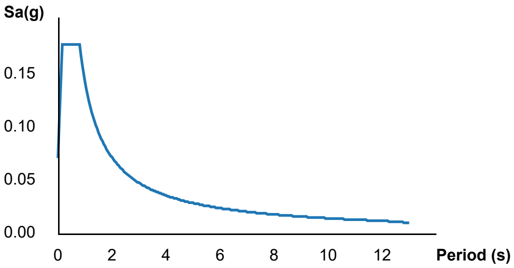
Search Information

Coordinates:	39.511503639532606, -86.05629293757323
Elevation:	762 ft
Timestamp:	2024-05-08T14:36:10.077Z
Hazard Type:	Seismic
Reference Document:	IBC-2012
Risk Category:	III
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.167	MCE$_R$ ground motion (period=0.2s)
S_1	0.089	MCE$_R$ ground motion (period=1.0s)
S_{MS}	0.267	Site-modified spectral acceleration value
S_{M1}	0.215	Site-modified spectral acceleration value
S_{DS}	0.178	Numeric seismic design value at 0.2s SA
S_{D1}	0.143	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	C	Seismic design category
F_a	1.6	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.906	Coefficient of risk (0.2s)
CR_1	0.865	Coefficient of risk (1.0s)
PGA	0.077	MCE$_G$ peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.123	Site modified peak ground acceleration
T_L	12	Long-period transition period (s)
SsRT	0.167	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.184	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.089	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.103	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)

PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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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.