# Geotechnical Engineering Report

**Panda Express Restaurant**
**Panda Project # S8-22-D8060**
**Spring Mill Road, Westfield, Indiana**
March 23, 2021
Terracon Project No. N4205460

**Prepared for:**
Panda Restaurant Group, Inc.
Rosemead, California

**Prepared by:**
Terracon Consultants, Inc.
Columbus, Ohio

terracon.com

Environmental ■ Facilities ■ Geotechnical ■ Materials

March 23, 2021

Panda Restaurant Group, Inc.
1683 Walnut Grove Avenue
Rosemead, California, 91770

Attn: Mr. Moira Stapleton- Corcoran
E: moira.stapleton@pandarg.com

Re: Geotechnical Engineering Report
Panda Express Restaurant
Spring Mill Road, Westfield, Indiana
Panda Project No. #S8-28-D8060
Terracon Project No. N4205460

Dear Ms. Stapleton-Corcoran:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with Master Services Agreement dated November 3, 2005 and signed Task Order dated November 12, 2020.

This report presents the findings of the subsurface exploration and provides geotechnical engineering recommendations regarding the design and construction of foundations, floor slabs and pavements for the proposed restaurant.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
**Terracon Consultants, Inc.**

Md Zaid

Mohammad Zaid
Staff Geotechnical Engineer

BABA M. YAHAYA REGISTERED PE11500100 STATE OF INDIANA PROFESSIONAL ENGINEER

Baba Yahaya, P.E.
Senior Engineer

Yogesh S. Rege, P.E.
Senior Principal

## REPORT TOPICS



## ATTACHMENTS

# Geotechnical Engineering Report

## Panda Express Restaurant

## Spring Mill Road, Westfield, Indiana

**Terracon Project No. N4205460**

**Panda Project No. #S8-22-D8060**

March 23, 2021

## INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed development in Spring Mill Road, Westfield, Indiana. The purpose of these services is to provide subsurface information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- site preparation and earthwork
- pavement design and construction
- foundation design and construction
- floor slab design and construction
- seismic site classification per IBC

The geotechnical engineering scope of services for this project included the advancement of seven (7) test borings, designated B-20-1 and B-20-2, and P-20-1 through P-20-5 to depths ranging from approximately 10 to 20 feet below the existing ground surface.

Maps showing the site and boring locations are shown on the **Site Location and Exploration Plans**, respectively. The results of the laboratory testing performed on select soil samples obtained from the site during the field exploration are included on the boring logs and attached separately in the **Exploration Results** section of this report.

## GEOLOGY

Based on the Indiana Department of Natural Resources Quaternary Geology Map of Indiana, the project site is located within the Till Plains section of Central Lowland region. This physiographic region is characterized with Wabash formation. The surficial geology at the project site consists of Wisconsinan-age loam till. The loam till is a heterogeneous mixture of clay, silt, sand, gravel, and rock fragments. The bedrock geology consists of Silurian-age limestone, dolomite and shale. These are sedimentary rocks with a marine or marginal marine origin. The primary rock is anticipated to be Limestone. The secondary rock is anticipated to be dolomite. The project site is not in an area prone to karst formations.

## SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of topographic maps.

| Item | Description |
|---|---|
| **Parcel information** | The project is located on the intersection of Spring Mill Rd. and W 176th St., Westfield, IN. This lot is about 28,000 sq ft. The approximate coordinates of the site are 40.041921°, -86.164477°. See **Site Location** |
| **Existing improvements** | Undeveloped lot. |
| **Current ground cover** | Based on our site visits, the current ground cover at the project site is comprised of dark clayey soils. Most recent aerial images show no construction around the boring location. |
| **Existing topography** | Based on observations during our site visit, the site appeared to be relatively level with ground surface elevations ranging from approximately 917 to 921 feet. |

## PROJECT DESCRIPTION

Our scope of work is based on our understanding of the project as described by you and is summarized below.

| Item | Description |
|---|---|
| **Information provided** | Site Concept Plan. |
| **Project description** | Based on the plan provided by the client the proposed development will include construction of an approximately 2,600 sq. ft. Panda Restaurant building. There will be 54 parking spaces and drive areas. |
| **Proposed structure** | We anticipate that the building will be a prefabricated steel frame structure with reinforced concrete foundations and slab-on-grade floor slab. |
| **Finished floor elevation** | Not established as of the date of this report. Based on the relatively flat site conditions, we have assumed a finished floor elevation of about +/- 2 feet from the existing plan, which appears to be about the average ground surface elevation within the site per Google Earth™. |
| **Maximum loads** | Not provided, we have assumed following structural loads:<br>■ Columns: 50 kips maximum<br>■ Walls: 2 kips per linear foot maximum<br>■ Slab: 100 psf. |

| Item | Description |
|---|---|
| **Grading/slopes** | A grading plan has not been provided as of the date of this report. Considering the relatively flat site conditions, we anticipate that less than 2 feet of cut and fill will be required within the site to achieve the finished subgrade elevations. |
| **Pavements** | Paved drive and parking areas are planned. We assume that both rigid (concrete) and flexible (asphalt) pavement sections would be considered.<br>No specific traffic information has been provided to us. Without this information, we have assumed the following traffic volumes for design of the pavement:<br>■ Car Parking Areas - Passenger Cars Only<br>Maximum of three 18-kip Equivalent Single Axle Loads per day<br>■ Drive Areas – Occasional Truck Traffic<br>Maximum of ten 18-kip Equivalent Single Axle Loads per day<br>The pavement design period is 20 years. If our assumptions are not consistent with the proposed design traffic volume, please inform us so that our pavement recommendations can be revised. |
| **Estimated start of construction** | Not Provided. |

# GEOTECHNICAL CHARACTERIZATION

## SUBSURFACE PROFILE

Based on the results of the borings, subsurface conditions at the boring locations can be generalized as follows:

| Stratum | Approximate Depth to Bottom of Stratum (feet) [1] | Material Description | Consistency/ Relative density/ Hardness |
|---|---|---|---|
| Surface | 0 to 2 | Topsoil | N/A |
| Stratum I (native soils) | 1 to 20.0 | Native cohesive soils consisting of Lean Clay (CL) with varying amounts of sand, silt and gravel | Soft to Very Stiff |
| Stratum II (native soils) [2,3] | 1 to 10.0 | Interbedded native granular soils consisting of Sand with varying amounts of silt, clay and gravel | Loose to Medium Dense |

1. Below existing ground surface.
2. Borings P-20-1 through P-20-5 were terminated in this stratum.
3. This stratum was encountered only in borings P-20-2, P-20-4, P-20-5.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section of this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

### Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater observed in the borings is summarized in the table below.

| Boring ID | Approximate Depth of Groundwater[1] | |
|---|---|---|
| | While Drilling | After Completion of Drilling |
| B-20-1 | Groundwater was not encountered during drilling | Groundwater was not encountered after completion |
| B-20-2 | 11.0’ | 20.0’ |
| P-20-1 | Groundwater was not encountered during drilling | 10.0’ |
| P-20-2 | 6.1’ | 10.0’ |
| P-20-3 | 10.0’ | Groundwater was not encountered after completion |
| P-20-4 | 7.0’ | 10.0’ |
| P-20-5 | Groundwater was not encountered during drilling | 10.0’ |

Due to the low permeability of the lean clay soils, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a bore hole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

## GEOTECHNICAL OVERVIEW

This overview should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be

read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

The recently completed test boring program indicated a subsurface profile consisting of surficial layer (topsoil) underlain by predominantly native cohesive soil with some occasional layers of native granular soil to the depths explored.

The proposed building foundations can be supported on a spread footing system after the recommendations provided in this report are implemented. We recommend that the shallow foundations bear on at least stiff native cohesive soil or medium dense native granular soil; or structural fill or lean concrete extending to native competent soil. Details are provided in section **Shallow Foundations** of this report.

At least stiff and medium dense native soils or structural fill are suitable as a supporting medium for the floor slab and pavement sections assuming subgrade is prepared by following recommendations provided in the **Earthwork** section of this report. Reworked existing native soils below topsoil generally appear suitable for pavement support provided the subgrade is proofrolled and unsuitable areas remediated by stabilizing or by undercutting and replacing the unsuitable/unstable areas. Proofrolling of exposed subgrades for pavement areas during site preparation process is an important aspect of the earthwork operations to provide for suitable subgrade for pavement support. Proofrolling and remediation of any soft, loose, medium stiff or unstable areas should be performed as outlined in the Earthwork section of this report.

Groundwater was encountered at depths ranging from about of 6.1 to 20.0 feet below existing site grades. Therefore, groundwater seepage is anticipated in the shallow excavations during the construction that extend below the groundwater table. Trapped water infiltration or minor groundwater seepage may be encountered, especially after a period of heavy precipitation and depending on when the construction is performed. In such an event, temporary dewatering methods such as sump and pumping methods can be used. It should be noted that groundwater readings recorded during the course of our exploration are considered short-term readings. Groundwater conditions during construction would likely be much different than those encountered by us. Therefore, if these readings are used for design, the risk lies solely with the designer. Groundwater control during and after construction is responsibility of others.

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

The **General Comments** section provides an understanding of the report limitations.

# EARTHWORK

The following paragraphs present recommendations for site preparation, excavation, subgrade preparation and placement of structural fill soils at the project site. The recommendations presented for design and construction of earth supported elements including foundations, slabs and pavements are contingent upon following the recommendations outlined in this section.

## Site Preparation

As an initial measure of site preparation, existing topsoil, vegetation or any other surficial deleterious material (e.g. debris, desiccated soil, frozen soil, etc.) should be completely stripped to expose the underlying soil subgrade in areas that will support the proposed building or pavements. Stripping depths between our boring locations and across the site could vary considerably. We recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material.

Removal and/or relocation of any “to be abandoned” utilities, as well as, installation of new underground utilities should be performed once the initial site preparation is done. Any abandoned underground pipes, remnant foundations, floor slabs, etc. if present, should be fully removed. Excavations created due to these activities should be backfilled with structural fill material, placed and compacted in accordance with the recommendations provided in the following paragraphs or with lean concrete or flowable fill. If lean concrete is used as backfill, the contractor should refer to all the new build Mechanical-Electrical-Plumbing (MEP) and foundation drawings to confirm that the concrete backfill materials will not conflict with any new item installations or construction of new footings, floor slabs, and utilities associated with the proposed building.

After performing the initial site preparation activities, the exposed subgrade soils within the limits of the proposed building and pavement areas should be proofrolled in the presence of a representative of the geotechnical engineer. The exposed cohesive soils should be proofrolled with a fully loaded, tandem axle dump truck or other suitable equipment weighing at least 20-tons. Granular soils, where encountered, should be proofrolled with several passes of a vibratory roller (minimum dead weight of 8 tons on the drum).

Any soft, loose or yielding areas encountered during proofrolling operations should be undercut to expose firm stable soils or reworked in place to a stable acceptable condition. Based on boring information, undercut/rework depths of about 2 feet below the topsoil layer should be anticipated. It should be noted that undercut depths somewhat greater than normal may be needed if the construction occurs during periods of inclement weather. The actual amount of undercut would need to be determined in the field during construction and is dependent on weather conditions and equipment used in the construction.

## Fill Material Types

Fill required to achieve design grade should be classified as structural fill. Structural fill is that material used below, or within 10 feet of structures, pavements or constructed slopes. Earthen materials used for structural fill should meet the following material property requirements:

| Fill Type [1] | USCS Classification | Acceptable Location for Placement |
|---|---|---|
| Lean clay | CL (LL<40 & PI<22) | All locations and elevations |
| Well graded granular | SW or GW[2] | All locations and elevations |
| Low Volume Change Material [3] | CL (LL<40 & PI<22) or SW or GW [2] | All locations and elevations |
| On-Site Native Soil | CL, CL-ML, SM, SC, SC-SM | The use of on-site soils as structural fill should meet the requirements for "acceptable location for placement" indicated above. Moisture conditioning of the onsite soils should be anticipated. |

1. Controlled, compacted fill should consist of approved materials that are free of organic matter (3% max.) and debris. Frozen materials should not be used, and fill should not be placed on a frozen subgrade, A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Crushed limestone aggregate, limestone screenings, or granular material such as sand, gravel or crushed stone.
3. Low plasticity cohesive soil and well graded granular soil.

## FILL COMPACTION REQUIREMENTS

Structural fill should meet the following compaction requirements.

| Item | Structural Fill |
|---|---|
| **Maximum individual lift thickness** | 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used<br>4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used |
| **Minimum compaction requirements** [1, 2,] | 98% of maximum dry density |
| **Water content range** [1] | Cohesive – Lean Clay: -2% to +3% of optimum<br>Cohesive – high plasticity Clay: 0% to +3% of optimum<br>Granular: -3% to +3% of optimum or workable moisture contents. |

1. Maximum dry density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).

## UTILITY TRENCH BACKFILL

All trench excavations should be made with sufficient working space to permit construction, including backfill placement and compaction. Small compaction equipment, such as a vibratory plate, jumping jack or walk-behind vibratory roller may be necessary. In these cases, compactive energy levels are lower and require smaller lift thicknesses to achieve compaction throughout the lift. Lift thicknesses should be maintained at 4 inches or less when using these types of small compaction equipment and the backfill should be compacted to the same criteria as presented for structural fill.

Compaction requirements for bedding and backfilling around utilities may need to be adjusted to the pipe material type and the pipe manufacturer bedding and backfill material recommendation. If utility trenches in non-pavement areas are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill. Granular backfill is recommended for use as backfill in utility trenches in areas beneath pavements.

## GRADING AND DRAINAGE

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. These greater movements can result in unacceptable differential floor slab and/or foundation movements,

cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure's maintenance program. Where paving or flatwork abuts the structure a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

It is recommended that any exposed earth slopes be seeded to provide protection against erosion. Seeded slopes should be protected with erosion control mats until the vegetation is established.

## EARTHWORK CONSTRUCTION CONSIDERATIONS

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Any water that collects over, or adjacent to, construction areas should be promptly removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction. All these processes should be observed by Terracon.

Although not anticipated, trapped water infiltration or groundwater seepage may be encountered, particularly after periods of precipitation. In such an event, sump and pumping methods may be used for temporary dewatering.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming any responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

## CONSTRUCTION OBSERVATION AND TESTING

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. This monitoring should include documentation of adequate removal of vegetation, topsoil, soft/unstable soils and unsuitable fill and debris, proof-rolling and mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event, unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

# SHALLOW FOUNDATIONS

We recommend that new building footings/foundations bear on at least stiff native soils, or medium dense native soil; or newly placed structural fill or lean concrete that extends to native competent soil. Native competent soil consists of at least stiff consistency cohesive soil or medium dense relative density granular soil. Where existing unsuitable conditions are encountered at the design footing bearing depth, the remedial methods recommended in section **Foundation Construction Considerations** below should be implemented. Design recommendations for shallow foundations to support the proposed building are presented below:

### Design Parameters – Compressive Loads

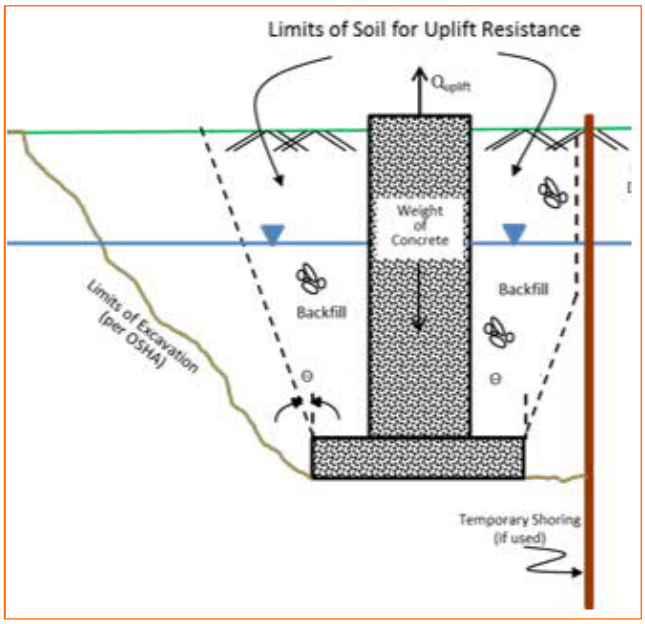
| Item | Description |
|---|---|
| Maximum net allowable bearing pressure [1, 2] | 2,000 psf |
| Required bearing stratum [3] | At least stiff/medium dense soils, or structural fill or lean concrete extending to native stiff soil. |
| Minimum foundation dimensions | Columns: 30 inches<br>Continuous: 18 inches |
| Ultimate coefficient of sliding friction [4] | 0.30 |
| Minimum embedment below finished grade [5] | Exterior footings in unheated areas: 36 inches<br>Interior footings in heated areas: 24 inches |
| Estimated total settlement from structural loads [2] | Less than about 1 inch |

| Item | Description |
|---|---|
| 1. | The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. The bearing pressure can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure. |
| 2. | Values provided are for maximum loads noted in **Project Description**. |
| 3. | Unsuitable, soft, medium stiff, or loose soils should be over-excavated and replaced according to the recommendations presented in Foundation Construction Considerations section below. |
| 4. | Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. |
| 5. | Embedment necessary to reduce the effects of frost on soil encountered at the site. |

We also recommend that the building foundations be suitably reinforced to resist movement from potential differential settlement. Walls and slabs should incorporate control joints to minimize effects of differential settlement, particularly in the building areas where significant cut/fill transitions will occur.

## DESIGN PARAMETERS - UPLIFT LOADS

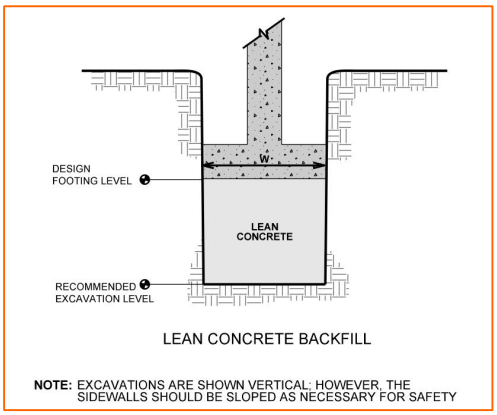
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 40 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 120 pcf should be used for the backfill. This unit weight should be reduced to 58 pcf for portions of the backfill or natural soils below the groundwater elevation.




## FOUNDATION CONSTRUCTION CONSIDERATIONS

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and soft/ medium stiff/loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the

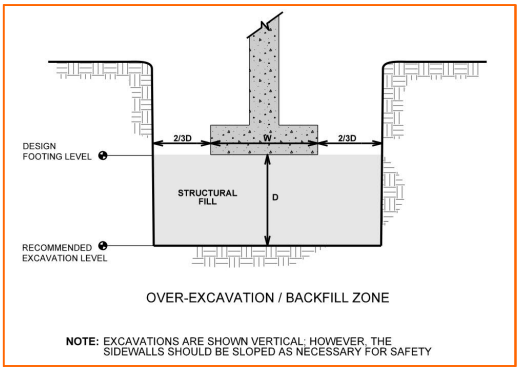
bearing materials during construction. Excessively wet or dry material or any soft/ medium stiff/ loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils (stiff cohesive soil), and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations.




LEAN CONCRETE BACKFILL

**NOTE:** EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

Over-excavation for structural fill placement below footings should be conducted as shown below. Over-excavation for compacted structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of over-excavation depth below footing base elevation. The over-excavation should then be backfilled up to the footing base elevation with granular structural fill material placed in lifts of 8 inches or less in loose thickness (4 inches or less if using hand-guided compaction equipment) and compacted according to the recommendations provided in **Earthwork** section of this *GeoReport*. The over-excavation and backfill procedure is described in the preceding figure.




OVER-EXCAVATION / BACKFILL ZONE

**NOTE:** EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

## SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7. Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the Seismic Site Classification is D Subsurface explorations at this site were extended to a maximum depth of 20 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

## FLOOR SLABS

Design parameters for floor slabs assume that the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure. This also includes the positive drainage of the aggregate base beneath the floor slab.

### Floor Slab Design Parameters

| Item | Description |
|---|---|
| **Floor slab support** [1] | Minimum 4 inches of free-draining (less than 6% passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 98% of ASTM D 698 [2, 3]<br>At least 18 inches of low plasticity cohesive or granular soils (LVC soils), compacted in accordance with **Earthwork** section of this report. |
| **Estimated modulus of subgrade reaction** [2] | 100 pounds per square inch per inch (psi/in) for point loads |

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
3. Free-draining granular material should have less than 5 percent fines (material passing the #200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor

retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates that any differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks that occur beyond the length of the structural dowels. The structural engineer should account for this potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

## FLOOR SLAB CONSTRUCTION CONSIDERATIONS

Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

# PAVEMENTS

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs, noted in this section, must be applied to the site, which has been prepared as recommended in the **Site Preparation** section.

## SUBGRADE PREPARATION

On most project sites, the site grading is accomplished relatively early in the construction phase. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy construction traffic disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the upper 24 inches of the subgrade be evaluated and the pavement subgrades be proof-rolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to anticipated high traffic areas and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

After proof-rolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in **Site Preparation** to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

### Pavement Design Parameters

Provided site preparation recommendations provided in this report are followed to prepare the pavement subgrade, a CBR value of 3 can be considered for pavement design. This value needs to be verified by performing laboratory CBR tests on representative on-site soil subgrade samples as the project progresses into final design and construction phase.

The minimum pavement section thicknesses presented in the section **Estimates of Minimum Pavement Thickness** are based on estimated traffic loading. Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we have assumed that traffic loads will be produced primarily by automobile traffic, delivery truck and trash

removal trucks. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

For areas subject to concentrated and repetitive loading conditions such as dumpster pads or loading dock areas, we recommend the use of a Portland Cement Concrete (PCC) pavement. For areas of PCC pavements, a subgrade modulus of 100 pci may be used for pavement design purposes.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;
- Install pavement drainage in surrounding areas anticipated for frequent wetting;
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

## ESTIMATES OF MINIMUM PAVEMENT THICKNESS

The following table provides options for Asphaltic Concrete and for Portland Cement Sections:

| Typical Pavement Section Thickness (inches) | | | | | | |
|---|---|---|---|---|---|---|
| **Traffic Area** | **Alternative** | **Asphalt Concrete Surface Course** | **Asphalt Concrete Base Course** | **Portland Cement Concrete [1]** | **Aggregate Base Course [2]** | **Total Thickness** |
| Light Duty (Automobiles only) | PCC | -- | -- | 5.0 | 4.0 | 9.0 |
| | AC | 1.5 | 1.5 | -- | 6.0 | 9.0 |
| Delivery Truck Drive Lane (Automobiles and occasional heavy-duty trucks) | PCC | -- | -- | 6.0 | 5.0 | 11.0 |
| | AC | 1.5 | 2.5 | | 8.0 | 12.0 |
| Trash Container Pad [3] | PCC | -- | -- | 7.0 | 5.0 | 12.0 |

1. 4,000 psi at 28 days, 4-inch maximum slump and 5 to 7 percent air entrained, 6-sack min. mix. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.
2. INDOT No. 53 crushed base material or an approved alternate gradation.
3. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.

## PAVEMENT DRAINAGE

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

## PAVEMENT MAINTENANCE

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

## GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the geotechnical conditions in the area, the data obtained from our site exploration and from our understanding of the project. Variations will occur between exploration point locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes only. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/ design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# SITE LOCATION AND EXPLORATION PLANS

**Contents:**

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

## SITE LOCATION

PANDA EXPRESS - WESTFIELD IN ■ Westfield, IN
March 23, 2021 ■ Terracon Project No. N4205460

Terracon GeoReport


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: WESTFIELD, IN (1/1/1992) and NOBLESVILLE, IN (1/1/1998).

## EXPLORATION PLAN

PANDA EXPRESS - WESTFIELD IN ■ Westfield, IN
March 23, 2021 ■ Terracon Project No. N4205460


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

# EXPLORATION AND TESTING PROCEDURES

## Field Exploration

| Number of Borings | Boring Depth (feet) [1] | Location |
|---|---|---|
| 2 | 20 | Building area |
| 5 | 10 | Parking/driveway area |

1. Below existing ground surface

**Boring Layout:** Terracon used a hand held GPS unit to locate the field exploration points. Elevations of the ground surface at each boring location were obtained from the GPS unit. The Locations and elevations of the soil borings locations as presented on the boring logs should be considered accurate only to the degree implied by the means and methods used to define them.

**Subsurface Exploration Procedures:** We advanced soil borings with a Probe drill rig using continuous flight hollow-stem augers. Continuous samples were obtained at 2-foot interval for the first 10 feet and thereafter at an interval of 5 feet. Soil sampling was performed using split-barrel sampling procedures. The samples were placed in appropriate containers and taken to our soil laboratory for testing. In addition, we observed and recorded groundwater levels during drilling and sampling.

Our exploration team member prepared field boring logs as part of the drilling operations that includes sampling depths, penetration distances, and other relevant sampling information. Field logs also include visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent the geotechnical engineer's interpretation, and include modifications based on observations and laboratory tests.

Prior to subsurface exploration Terracon made a call to the State 811 services to clear the public utilities at the project site. Also, as requested by the client Terracon hired a third-party subcontractor to locate any private underground utilities nearby boring locations.

**Property Disturbance:** We backfilled borings with auger cuttings after completion and patched the surface layer with cold asphalt mix for borings located in asphalt pavement areas. Excess auger cuttings were dispersed in the general vicinity of the borehole. Because backfill material often settles below the surface after a period, we recommend that the boreholes be checked periodically and backfilled, if necessary.

## LABORATORY TESTING AND RESULTS

The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of various soil strata. Our laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified soil samples in accordance with the Unified Soil Classification System (USCS). The following tests were performed on selected soil samples:

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

# EXPLORATION RESULTS

**Contents:**



Note: All attachments are one page unless noted above.

# BORING LOG NO. B-20-1



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0419° Longitude: -86.1645°

Approximate Surface Elev.: 918 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | Description |
|---|---|---|
| 1.0 | 917+/- | **TOPSOIL (12")** |
| | | **SANDY SILTY CLAY (CL-ML)**, brown, moist, soft to medium stiff |
| | | -turning gray at 4.0' |
| 6.0 | 912+/- | **LEAN CLAY (CL)**, trace sand and trace gravel, brown, moist, stiff to very stiff |
| 20.0 | 898+/- | ***Boring Terminated at 20 Feet*** |

| DEPTH (Ft.) | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|
| | | 24 | 2-2-2-2 N=4 | 3.0 (HP) | 20.2 | |
| | | 24 | 2-4-8-8 N=12 | 0.5 (HP) | 13.8 | |
| 5 | | 24 | 3-4-4-3 N=8 | 1.0 (HP) | 13.4 | 19-13-6 |
| | | 24 | 4-6-8-8 N=14 | 2.5 (HP) | 10.6 | |
| | | 24 | 5-6-9-18 N=15 | 3.0 (HP) | 10.7 | |
| 10 | | | | | | |
| | | 24 | 5-7-14-14 N=21 | 4.0 (HP) | 10.1 | |
| 15 | | | | | | |
| | | 24 | 9-10-11-12 N=21 | 3.0 (HP) | 12.0 | |
| 20 | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater was not observed during drilling*

*Groundwater was not encountered after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-01-2021 | Boring Completed: 03-01-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. B-20-2



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0421° Longitude: -86.1644°

Approximate Surface Elev.: 920 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DESCRIPTION | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|---|
| | | **TOPSOIL (12")** | | | | | |
| 1.0 | 919+/- | **SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, stiff to very stiff, -turning medium stiff between 0.0' - 2.0' | 24 | 2-2-3-3 N=5 | 2.5 (HP) | | |
| | | | 24 | 4-4-5-5 N=9 | 1.0 (HP) | 20.9 | 29-15-14 |
| 5 | | | 24 | 3-4-6-8 N=10 | 2.0 (HP) | 12.9 | |
| | | | 24 | 6-8-10-10 N=18 | 4.5 (HP) | 10.4 | |
| | | -turning gray at 8.0' | 24 | 5-11-7-8 N=18 | 2.5 (HP) | 14.4 | |
| 10 | | | | | | | |
| | | | 24 | 6-8-10-12 N=18 | 3.0 (HP) | 10.8 | |
| 15 | | | | | | | |
| | | | 24 | 10-10-11-11 N=21 | 4.5 (HP) | 13.0 | |
| 20.0 | 900+/- | | | | | | |
| | | ***Boring Terminated at 20 Feet*** | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater was observed at 11.0' during drilling*

*Groundwater was encountered at 20.0' after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-01-2021 | Boring Completed: 03-01-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. P-20-1



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0416° Longitude: -86.1644°

Approximate Surface Elev.: 917 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|---|---|---|
| **TOPSOIL (24")** | | | | | | | | | |
| 2.0 | 915+/- | | | | | | | | |
| **SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, stiff to very stiff | | | | | 24 | 2-3-3-3 N=6 | - | 15.4 | |
| -turning brown to gray between 4.0' - 6.0' | | | | | 24 | 3-5-5-7 N=10 | 3.0 (HP) | 11.5 | |
| | | 5 | | | 24 | 3-5-8-10 N=13 | 4.0 (HP) | 13.2 | |
| -turning gray at 6.0' | | | | | 24 | 6-10-12-12 N=22 | 4.0 (HP) | 11.2 | |
| 10.0 | 907+/- | | ▽ | | 24 | 7-10-12-14 N=22 | 3.0 (HP) | 10.6 | |
| ***Boring Terminated at 10 Feet*** | | 10 | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater was not observed during drilling*

▽ *Groundwater was encountered at 10.0' after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-01-2021 | Boring Completed: 03-01-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. P-20-2



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0417° Longitude: -86.1645°

Approximate Surface Elev.: 919 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|---|---|---|
| **TOPSOIL (19")** | | | | | | | | | |
| 1.6 | 917.5+/- | | | | 24 | 4-6-8-8 N=14 | - | | |
| **SILTY SAND (SM)**, trace gravel, brown, moist, medium dense | | | | | | | | | |
| 4.0 | 915+/- | | | | 24 | 8-8-10-10 N=18 | - | | |
| **CLAYEY SAND WITH GRAVEL (SC)**, brown, moist, loose | | 5 | | | | | | | |
| 6.0 | 913+/- | | ▽ | | 24 | 4-5-4-3 N=9 | - | | |
| **SANDY LEAN CLAY (CL)**, trace gravel, gray, moist, stiff to very stiff | | | | | 24 | 4-4-6-8 N=10 | 2.0 (HP) | 12.7 | |
| 10.0 | 909+/- | 10 | ▽ | | 24 | 5-10-15-15 N=25 | 4.0 (HP) | 9.6 | |
| ***Boring Terminated at 10 Feet*** | | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

▽ *Groundwater was observed at 6.1' during drilling*

▽ *Groundwater was encountered at 10.0' after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-01-2021 | Boring Completed: 03-01-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. P-20-3



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0417° Longitude: -86.1647°

Approximate Surface Elev.: 921 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|---|---|---|
| **TOPSOIL (12")** | | | | | | | | | |
| 1.0 | 920+/- | | | | | | | | |
| **SANDY LEAN CLAY (CL)**, trace gravel, brown with gray, moist, stiff to very stiff | | | | | 24 | 3-4-5-7 N=9 | 3.25 (HP) | 14.8 | |
| | | | | | 24 | 4-5-6-8 N=11 | 1.5 (HP) | 11.8 | |
| -turning gray at 4.0' | | 5 | | | 24 | 3-4-5-6 N=9 | 1.75 (HP) | 11.1 | |
| | | | | | 24 | 6-6-8-8 N=14 | 3.5 (HP) | 10.5 | |
| | | | ▽ | | 24 | 7-7-8-8 N=15 | 4.5 (HP) | 10.2 | |
| 10.0 | 911+/- | 10 | | | | | | | |
| ***Boring Terminated at 10 Feet*** | | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

▽ *Groundwater was observed at 10.0' during drilling*

*Groundwater was not encountered after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-02-2021 | Boring Completed: 03-02-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. P-20-4



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0420° Longitude: -86.1648°

Approximate Surface Elev.: 921 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | | | | | | | | |
| **TOPSOIL (12")** 1.0 | 920+/- | | | | | | | | |
| **CLAYEY SAND (SC)**, trace gravel, brown with gray, moist, loose to medium dense | | | | | 24 | 2-3-3-2 N=6 | - | 18.5 | 41-15-26 |
| 4.0 | 917+/- | | | | 24 | 4-5-5-5 N=10 | - | | |
| **SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff to stiff | | 5 | | | 24 | 2-2-3-3 N=5 | 1.5 (HP) | 12.1 | |
| -turning gray at 6.0' | | | ▽ | | 24 | 4-5-6-7 N=11 | 1.75 (HP) | 10.9 | |
| 8.0 | 913+/- | | | | | | | | |
| **SILTY SAND (SM)**, trace gravel, gray, moist, medium dense | | | | | 24 | 7-9-16-16 N=25 | - | | |
| 10.0 | 911+/- | 10 | ▽ | | | | | | |
| ***Boring Terminated at 10 Feet*** | | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

▽ *Groundwater was observed at 7.0' during drilling*

▽ *Groundwater was encountered at 10.0' after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-02-2021 | Boring Completed: 03-02-2021

Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# BORING LOG NO. P-20-5



**PROJECT: PANDA EXPRESS - WESTFIELD IN**

**CLIENT: Panda Restaurant Group Inc**
**Rosemead, CA**

**SITE: IN-32**
**Westfield, IN**

LOCATION See Exploration Plan

Latitude: 40.0421° Longitude: -86.1646°

Approximate Surface Elev.: 921 (Ft.) +/-

| DEPTH | ELEVATION (Ft.) | DESCRIPTION |
|---|---|---|
| 1.0 | 920+/- | **TOPSOIL (12")** |
| 2.0 | 919+/- | **SANDY LEAN CLAY (CL)**, trace gravel, brown to gray, moist, medium stiff |
| 4.0 | 917+/- | **SILTY CLAYEY SAND (SC-SM)**, brown, moist, loose |
| 6.0 | 915+/- | **CLAYEY SAND (SC)**, trace gravel, brown, moist, loose |
| 10.0 | 911+/- | **SANDY LEAN CLAY (CL)**, trace gravel, brownish gray to gray, moist, stiff |
| | | ***Boring Terminated at 10 Feet*** |

| DEPTH (Ft.) | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI |
|---|---|---|---|---|---|---|
| | | 24 | 2-2-3-3 N=5 | 1.25 (HP) | 24.6 | |
| | | 24 | 4-4-3-2 N=7 | - | | |
| 5 | | 24 | 1-2-3-6 N=5 | - | | |
| | | 24 | 4-5-6-7 N=11 | 2.5 (HP) | 11.2 | |
| 10 | | 24 | 5-5-5-6 N=10 | 2.75 (HP) | 10.3 | |

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2.75" I.D. Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater was not observed during drilling*

*Groundwater was encountered at 10.0' after completion*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 03-01-2021 | Boring Completed: 03-02-2021

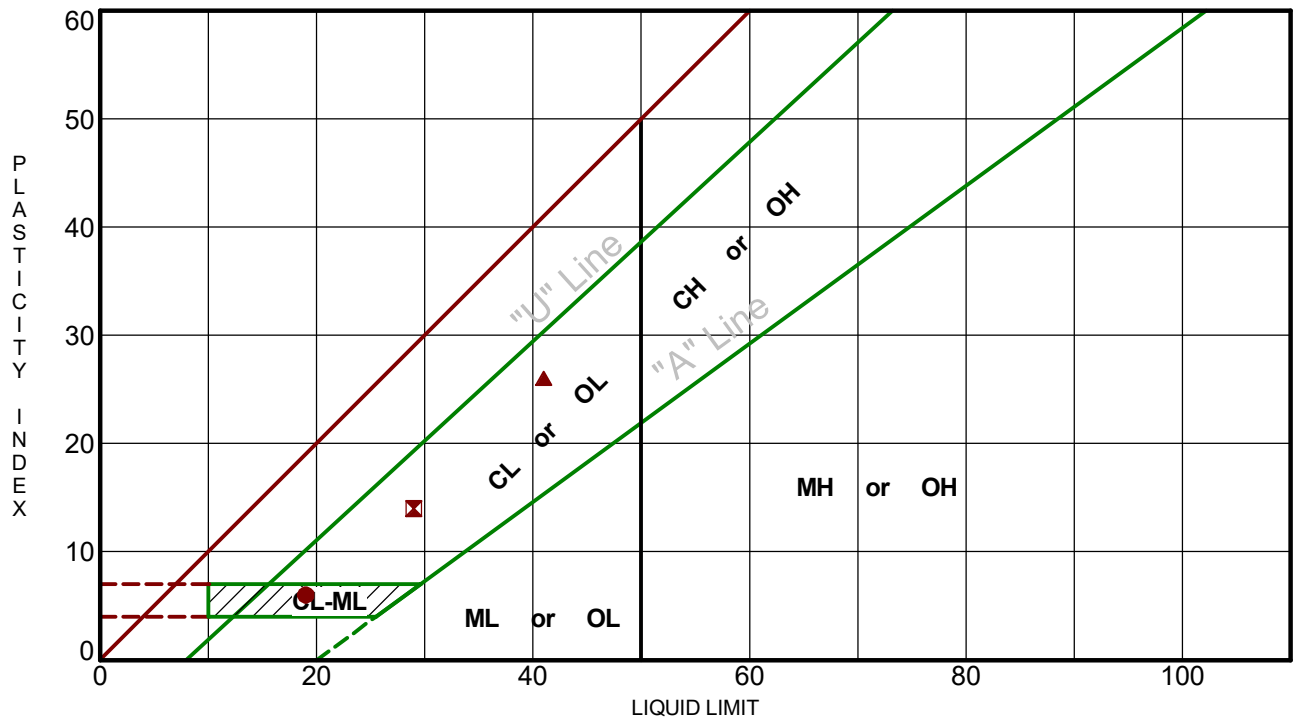
Drill Rig: CME 550 | Driller: J. Warren

Project No.: N4205460

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/23/21

# ATTERBERG LIMITS RESULTS

**ASTM D4318**




| Boring ID | | Depth | LL | PL | PI | Fines | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| ● | B-20-1 | 4 - 6 | 19 | 13 | 6 | 55.4 | CL-ML | SANDY SILTY CLAY |
| ⊠ | B-20-2 | 2 - 4 | 29 | 15 | 14 | 59.4 | CL | SANDY LEAN CLAY |
| ▲ | P-20-4 | 0 - 2 | 41 | 15 | 26 | 42.0 | SC | CLAYEY SAND |

PROJECT: PANDA EXPRESS - WESTFIELD IN

PROJECT NUMBER: N4205460

SITE: IN-32
Westfield, IN

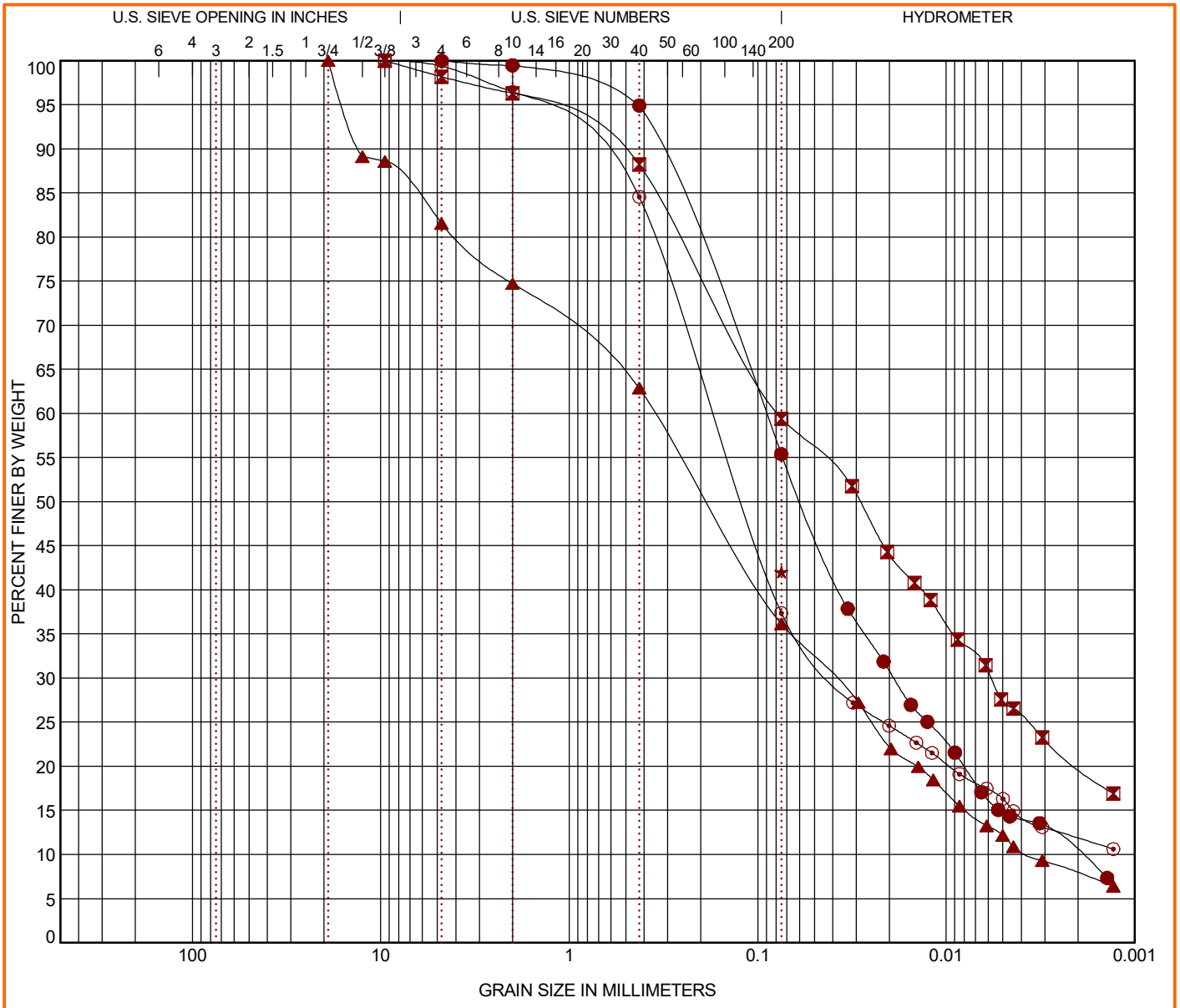
Terracon
800 Morrison Rd
Gahanna, OH

CLIENT: Panda Restaurant Group Inc
Rosemead, CA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS N4205460 PANDA EXPRESS - W.GPJ TERRACON_DATATEMPLATE.GDT 3/19/21

# GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | | Depth | USCS Classification | WC (%) | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | B-20-1 | 4 - 6 | SANDY SILTY CLAY (CL-ML) | 13.4 | 19 | 13 | 6 | 1.96 | 45.98 |
| ⊠ | B-20-2 | 2 - 4 | SANDY LEAN CLAY (CL) | 20.9 | 29 | 15 | 14 | | |
| ▲ | P-20-2 | 4 - 6 | | | | | | 1.20 | 97.45 |
| ★ | P-20-4 | 0 - 2 | CLAYEY SAND (SC) | 18.5 | 41 | 15 | 26 | | |
| ⊙ | P-20-5 | 2 - 4 | | | | | | | |

| Boring ID | | Depth | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Cobbles | %Gravel | %Sand | %Silt | %Fines | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ● | B-20-1 | 4 - 6 | 4.75 | 0.092 | 0.019 | 0.002 | 0.0 | 0.0 | 44.6 | 40.6 | | 14.7 |
| ⊠ | B-20-2 | 2 - 4 | 9.5 | 0.078 | 0.006 | | 0.0 | 1.8 | 38.8 | 32.0 | | 27.4 |
| ▲ | P-20-2 | 4 - 6 | 19 | 0.353 | 0.039 | 0.004 | 0.0 | 18.4 | 45.4 | 24.0 | | 12.2 |
| ★ | P-20-4 | 0 - 2 | 0.075 | | | | | | | | 42.0 | |
| ⊙ | P-20-5 | 2 - 4 | 9.5 | 0.172 | 0.04 | | 0.0 | 0.6 | 62.0 | 21.1 | | 16.3 |

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# SUPPORTING INFORMATION

# GENERAL NOTES

**DESCRIPTION OF SYMBOLS AND ABBREVIATIONS**
**PANDA EXPRESS - WESTFIELD IN ■ Westfield, IN**
**Terracon Project No. N4205460**

Terracon GeoReport

| SAMPLING | WATER LEVEL | FIELD TESTS |
|---|---|---|
| Split Spoon | Water Initially Encountered<br>Water Level After a Specified Period of Time<br>Water Level After a Specified Period of Time<br>Cave In Encountered<br><br>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations. | N Standard Penetration Test Resistance (Blows/Ft.)<br>(HP) Hand Penetrometer<br>(T) Torvane<br>(DCP) Dynamic Cone Penetrometer<br>UC Unconfined Compressive Strength<br>(PID) Photo-Ionization Detector<br>(OVA) Organic Vapor Analyzer |

## DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

## LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

## STRENGTH TERMS

| RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance | | CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance | | |
|---|---|---|---|---|
| **Descriptive Term (Density)** | **Standard Penetration or N-Value Blows/Ft.** | **Descriptive Term (Consistency)** | **Unconfined Compressive Strength Qu, (tsf)** | **Standard Penetration or N-Value Blows/Ft.** |
| Very Loose | 0 - 3 | Very Soft | less than 0.25 | 0 - 1 |
| Loose | 4 - 9 | Soft | 0.25 to 0.50 | 2 - 4 |
| Medium Dense | 10 - 29 | Medium Stiff | 0.50 to 1.00 | 4 - 8 |
| Dense | 30 - 50 | Stiff | 1.00 to 2.00 | 8 - 15 |
| Very Dense | > 50 | Very Stiff | 2.00 to 4.00 | 15 - 30 |
| | | Hard | > 4.00 | > 30 |

## RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

# UNIFIED SOIL CLASSIFICATION SYSTEM

Panda Express Restaurant ■ Spring Mill Road, Westfield, Indiana

March 23, 2021 ■ Terracon Project No. N4205460

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A] | | | | | Soil Classification | |
|---|---|---|---|---|---|---|
| | | | | | Group Symbol | Group Name [B] |
| **Coarse-Grained Soils:** More than 50% retained on No. 200 sieve | **Gravels:** More than 50% of coarse fraction retained on No. 4 sieve | **Clean Gravels:** Less than 5% fines [C] | Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E] | | GW | Well-graded gravel [F] |
| | | | Cu < 4 and/or 1 > Cc > 3 [E] | | GP | Poorly graded gravel [F] |
| | | **Gravels with Fines:** More than 12% fines [C] | Fines classify as ML or MH | | GM | Silty gravel [F,G,H] |
| | | | Fines classify as CL or CH | | GC | Clayey gravel [F,G,H] |
| | **Sands:** 50% or more of coarse fraction passes No. 4 sieve | **Clean Sands:** Less than 5% fines [D] | Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E] | | SW | Well-graded sand [I] |
| | | | Cu < 6 and/or 1 > Cc > 3 [E] | | SP | Poorly graded sand [I] |
| | | **Sands with Fines:** More than 12% fines [D] | Fines classify as ML or MH | | SM | Silty sand [G,H,I] |
| | | | Fines classify as CL or CH | | SC | Clayey sand [G,H,I] |
| **Fine-Grained Soils:** 50% or more passes the No. 200 sieve | **Silts and Clays:** Liquid limit less than 50 | **Inorganic:** | PI > 7 and plots on or above "A" line | | CL | Lean clay [K,L,M] |
| | | | PI < 4 or plots below "A" line [J] | | ML | Silt [K,L,M] |
| | | **Organic:** | Liquid limit - oven dried | < 0.75 | OL | Organic clay [K,L,M,N] |
| | | | Liquid limit - not dried | | | Organic silt [K,L,M,O] |
| | **Silts and Clays:** Liquid limit 50 or more | **Inorganic:** | PI plots on or above "A" line | | CH | Fat clay [K,L,M] |
| | | | PI plots below "A" line | | MH | Elastic Silt [K,L,M] |
| | | **Organic:** | Liquid limit - oven dried | < 0.75 | OH | Organic clay [K,L,M,P] |
| | | | Liquid limit - not dried | | | Organic silt [K,L,M,Q] |
| **Highly organic soils:** | Primarily organic matter, dark in color, and organic odor | | | | PT | Peat |

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.