GEOTECHNICAL ENGINEERING REPORT

Shoal Creek Condominiums
1501 Shoal Creek Boulevard
Austin, Texas

PSI Project No. 03031973

PREPARED FOR:

Shoal Creek Development, LLC
6200 Savoy Drive, Suite #500
Houston, Texas 77036

May 29, 2025

BY:

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GEOTECHNICAL, CONSTRUCTION MATERIALS TESTING, & ENVIRONMENTAL SERVICES

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May 29, 2025

Shoal Creek Development, LLC
6200 Savoy Drive, Suite #500
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Attn: Mr. Joseph Lee

RE: GEOTECHNICAL ENGINEERING REPORT
SHOAL CREEK CONDOMINIUMS
1501 SHOAL CREEK BOULEVARD
AUSTIN, TEXAS 78701
PSI Project No. 03031973

Dear Mr. Lee:

Professional Service Industries, Inc. (PSI), an Intertek company, is pleased to submit this Geotechnical Engineering Report for the above-referenced project. This report includes the results from the field and laboratory investigation along with recommendations for use in preparation of the appropriate design and construction documents for this project.

PSI appreciates the opportunity to provide this Geotechnical Engineering Report and looks forward to continuing participation during the design and construction phases of this project. If there are questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

PSI also has great interest in providing materials testing and inspection services during the construction of this project.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.
Texas Board of Professional Engineers Certificate of Registration # F003307

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1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries, Inc. (PSI), an Intertek company, has completed a field exploration and geotechnical evaluation for the proposed Shoal Creek Condominiums project. Mr. Joseph Lee, representing Shoal Creek Development, LLC, authorized PSI's services on April 16, 2025, by signing PSI Proposal No. 0303-449798. PSI's proposal contained a proposed scope of work, lump sum fee, and PSI's General Conditions.

1.2 PROJECT DESCRIPTION

Based on information provided by the Client, PSI's review of a site plan titled "Land Use/Site Plan", and the results of this geotechnical investigation, a summary of the proposed project is provided below in the following table.

TABLE 1.1: GENERAL PROJECT DESCRIPTION

Project Description	One (1) approximately 33,000 square feet footprint, 10-story building with associated parking and driveways. The building will be cast in place. No basements are currently planned.
Building Construction Type	Unknown
Existing Grade Change within Building Pad	± 20 feet estimated (Google Earth Pro Data)
Existing Grade Change within Project Site	± 40 feet estimated (Google Earth Pro Data)
Finished Floor Elevation	Not available at this time Assumed to be within 2 feet ± of current grade
Anticipated Foundation Type	Drilled Shafts
Anticipated Maximum Column Loading	1,100 kips (sustained) and 1,450 kips (total)
Anticipated Maximum Wall Loading	75 kips/Foot (sustained) and 100 kips/Foot (total)
Pavement for Parking and Drives	Flexible Asphalt (HMAC) and/or Rigid Concrete Pavement

The geotechnical recommendations presented in this report are based on the available project information, structure locations, and the subsurface materials encountered during the field investigation. If the noted information or assumptions are incorrect, please inform PSI so that the recommendations presented in this report can be amended as necessary. PSI will not be responsible for the implementation of recommendations provided if not notified of changes in the project.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study is to evaluate the subsurface conditions at the site and develop geotechnical engineering recommendations and guidelines for use in preparing the design and other related construction documents for the proposed project. The scope of services included drilling borings, performing laboratory testing, and preparing this geotechnical engineering report.

This report briefly outlines the available project information, describes the site and subsurface conditions, and presents the recommendations regarding the following:

- General site development and subgrade preparation;
- Estimated potential soil movements associated with shrinking and swelling soils and methods to reduce these movements to acceptable levels;
- Recommendations for site excavation, fill compaction, and the use of on-site and imported fill material under pavements and the structure;
- Recommendations for building pad preparation for ground-supported slabs having a maximum movement potential, due to heave or settlement, of 1-inch;
- Recommendations for the design of foundations for supporting the proposed structure, which includes drilled shaft/pier design criteria including end bearing and skin friction values, as well as LPILE design values for lateral load analysis;
- Seismic design site classification per the 2021 International Building Code; and
- Recommendations for the design of flexible asphaltic and rigid concrete pavement systems for the proposed parking and drive areas.

The scope of services for this geotechnical exploration did not include an environmental, mold nor detailed seismic/fault assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The following table provides a generalized description of the existing site conditions based on visual observations during the field activities, as well as other available information.

TABLE 2.1: SITE DESCRIPTION

Site Location	Address: 1501 Shoal Creek Blvd., Austin, Texas 78701 GPS Coordinates: Latitude: 30.2810°; Longitude: -97.7497°
Site History	Previously developed and consists of buildings along with paved areas
Existing Site Ground Cover	Pavement, Foundations, Wooded
Existing Site Features	Gently Sloped
Existing Grade/Elevation Changes	General Incline to the North
Site Boundaries	North: Pease Park Conservatory East: Residential, 17th Street South: Charles Forest West: N Lamar Boulevard
Ground Surface Soil Support Capability	Firm enough for field equipment if dry

2.2 FIELD EXPLORATION

Field exploration for the project consisted of drilling a total of four (4) borings. The boring design element, boring labels, and approximate depths are provided in the following table.

TABLE 2.2: FIELD EXPLORATION SUMMARY

Design Element	Boring Label	Boring Location	Approx. Depth of Boring (Feet)
Building	B-1	Lat: 30.2811°, Long: -97.7500°	70
	B-2	Lat: 30.2806°, Long: -97.7499°	50
	B-3	Lat: 30.2813°, Long: -97.7497°	50
	B-4	Lat: 30.2805°, Long: -97.7496°	70
Note: PSI would suggest that after the building demolition occurs, additional boring may be required for a review and verification of the soil beneath the demolished building. PSI has not taken any soil borings in that area.			

The boring locations were selected by PSI personnel and located in the field using a recreational-grade GPS system. Elevations of the ground surface at the boring locations were not provided and should be surveyed by others prior to construction. The references to elevations of various subsurface strata are based on depths below existing grade at the time of drilling. The approximate boring locations are depicted on the Boring Location Plan provided in the Appendix.

TABLE 2.3: FIELD EXPLORATION DESCRIPTION

Drilling Equipment	Truck-Mounted Drilling Equipment
Drilling Method	Continuous Flight Augers, Air Rotary
Drilling Procedure	Applicable ASTM and PSI Safety Manual
Field Testing	Hand Penetrometer, Standard Penetration Test (ASTM D1586), Rock Quality Designation (ASTM D6032), Rock Core Recovery
Sampling Procedure	Soils: ASTM D1587/1586 Rock Coring: ASTM D2113 (NWD4 Core Barrel)
Sampling Frequency	Continuously to a Depth of 10 Feet and at 5-foot Intervals Thereafter
Frequency of Groundwater Level Measurements	During and After Drilling
Boring Backfill Procedures	Soil Cuttings, Asphalt Patch

During field activities, the encountered subsurface conditions were observed, logged, and visually classified (in general accordance with ASTM D2487). Field notes were maintained to summarize soil types and descriptions, water levels, changes in subsurface conditions, and drilling conditions.

2.3 LABORATORY TESTING PROGRAM

PSI supplemented the field exploration with a laboratory testing program to determine additional engineering characteristics of the subsurface soils encountered. The laboratory testing program included:

TABLE 2.4: LABORATORY TESTING PROGRAM

Laboratory Test	Procedure Specification
Visual Classification	ASTM D2488
Moisture Content	ASTM D2216
Atterberg Limits	ASTM D4318
Material Finer than No. 200	ASTM D1140
Rock Compression Strength Test[1]	ASTM D7012

The laboratory testing program was conducted in general accordance with applicable ASTM Test Methods. The results of the laboratory tests are provided on the Boring Logs in the Appendix. Portions of samples not altered or consumed by laboratory testing will be discarded 60 days from the date shown on this report.

[1] Test specimens were prepared with a best effort to conform to ASTM D4543 guidelines. While the specimen may not fully meet all requirements of ASTM D4543, any results obtained may differ from those on a fully compliant specimen, although preparation followed ASTM D4543 procedures.

2.4 SITE GEOLOGY

As shown on the Geologic Map of the Austin Area, Texas, reprinted in 1981, the site is located in an area where a complex geologic setting occurs. Based on the reference map, the main geologic formations which could be present at or near the ground surface are the **Del Rio Clay Formation** (**Kdr**), the Buda Formation (**Kbu**), or the **Georgetown Formation** (**Kgt**). Based on the samples obtained from the test borings, PSI has concluded that the Georgetown Formation is present at this site. The Georgetown Formation generally consists mostly of limestone and marl with some shale. This formation is typically overlain by high plasticity clays.

2.5 SUBSURFACE CONDITIONS

The results of the field and laboratory investigation have been used to generalize a subsurface profile at the project site. The following subsurface descriptions provide a highlighted generalization of the major subsurface stratification features and material characteristics.

TABLE 2.5: GENERALIZED SOIL PROFILE [B-1 & B-4]

Layer	Depth of Layer (ft)		Soil Type	ω (%)	LL (%)	PI	% Pass. #200
	Top	Bottom					
1	0	0.7	Asphalt and Base	-	-	-	-
2A	0 to 0.7	2 to 28.5	Fat Clay with Varying Sand Content	14 to 20	57 to 67	40 to 45	83 to 96
2B	2	8.5	Clayey Sand with Varying Gravel Content	3 to 7	-	-	-
2C	8.5	33.5	Fat Clay	14 to 20	58	41	90
3	28.5 to 33.5	70	Shale	13 to 17	-	-	-

TABLE 2.6: GENERALIZED SOIL PROFILE [B-2 & B-3]

Laye r	Depth of Layer (ft)		Soil Type	ω (%)	LL (%)	PI	% Pass. #200
	Top	Bottom					
1	0	0.5	Asphalt and Base	-	-	-	-
2A	0 to 0.5	18.5	Fat/Lean Clay with Varying Sand Content	6 to 18	33 to 58	18 to 38	54 to 83
2B	2 to 18.5	6 to 23.5	Clayey Sand/Gravelly Lean Clay with Varying Sand Content	4 to 16	42	27	23
	18.5 to 23.5	28.5	Fat Clay	17 to 18	-	-	-
3	30 to 35	50	Shale	17 to 18	-	-	-

1. *w = Moisture Content (%)*
2. *LL= Liquid limit (%)*
3. *PI = Plasticity Index*
4. *-#200 Sieve = % Passing the #200 Sieve*

The boring logs included in the Appendix should be reviewed for specific information at individual boring locations. The boring logs include soil descriptions, stratifications, locations of the samples, and field and laboratory test data. The descriptions provided in the logs only represent the conditions at that actual boring location; the stratifications represent the approximate boundaries between subsurface materials. The actual transitions between strata may be more gradual and less distinct. Variations will occur and should be expected across the site.

2.5.1 GROUNDWATER INFORMATION

Water level measurements were performed during drilling and after completion of drilling. Specific information concerning groundwater is noted on each boring log presented in the Appendix of this report. Groundwater **was not** encountered during the field investigation of this site.

Groundwater levels fluctuate seasonally as a function of rainfall, proximity to creeks, rivers and lakes, the infiltration rate of the soil, seasonal and climatic variations and land usage. In relatively pervious soils, such as sandy soils, the indicated depths are a relatively reliable indicator of groundwater levels. In relatively impervious soils, water levels observed in the borings may not provide a reliable indication of groundwater elevations, even after several days. If a detailed water level evaluation is required, observation wells or piezometers can be installed at the site to monitor water levels.

The groundwater levels presented in this report were measured at the time of PSI field activities. The contractor should determine the actual groundwater levels at the site before construction activities.

3.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

3.1 GEOTECHNICAL DISCUSSION

Based upon the information gathered from the soil borings and laboratory testing, the clay soils encountered at this site within the seasonally active zone have a **high** potential for expansion. PSI recommends the expansive potential (i.e. "Potential Vertical Movement" or PVM) of these soils be addressed in the design and construction of this project to reduce the potential for foundation movements and foundation distress.

PSI recommends that the building be supported on deep drilled piers due to their relatively heavy structural loading and to reduce the potential for detrimental settlement.

An improved foundation pad must be constructed under soil-supported floor slab and foundation elements due to the presence of expansive foundation soils. Several methods are available to reduce the PVM of the foundation soil beneath a grade-supported foundation or floor slab. PSI recommends excavating and moisture conditioning onsite or imported general fill for use as density and moisture controlled engineered fill (Reconditioning Method).

The following design recommendations have been developed based on the previously described project characteristics and subsurface conditions encountered. If there are changes in the project criteria, PSI should be retained to determine if modifications in the recommendations will be required. The findings of such a review would be presented in a supplemental report. Once final design plans and specifications are available, a general review by PSI is recommended to observe that the conditions assumed in the project description are correct and verify that the earthwork and foundation recommendations are properly interpreted and implemented within the construction documents.

3.2 POTENTIAL VERTICAL MOVEMENT OF EXPANSIVE SOILS

The soils encountered at the soil boring locations exhibit a **high** potential for volumetric changes, due to fluctuations in soil moisture content. PSI has conducted laboratory testing on the soils to estimate the expansive soil potential with soil moisture variations. These soil moisture variations are based on historical climate change data for a particular site detailed in the Thornthwaite Moisture Index Maps. Determining the soil potential for shrinking and swelling, combined with historical climate variation, aids the engineer in quantifying the soil movement potential of the soils supporting the floor slab and shallow foundations. Various shrink/swell movement procedures, and two soil modeling systems, the Post Tensioning Institute's (PTI) "Design of Post-Tensioned Slabs-on-Ground, 3rd Edition" and Texas Department of Transportation (TxDOT) method TEX-124-E, were used to approximate the Potential Vertical Movement (PVM) for this location.

3.2.1 SHRINK/SWELL MOVEMENT (PVM) ESTIMATE

Based on laboratory testing results, and the TEX-124-E and the PTI methods, the potential vertical movement within the proposed project area was estimated to be approximately **3 to 4 inches.**

It is not possible to accurately quantify actual soil moisture changes and resulting shrink/swell movements. The PVM and referenced structural movements values provided should not be considered absolute values that could occur in the field but approximate values based on industry standard practice and experience. Extreme soil moisture variations could occur due to unusual drought severity, leaking water or sewer lines, poor drainage (possibly due to landscape changes after construction), irrigation line breaks, perched groundwater infiltration, springs, soil desiccation from large trees located adjacent to the building or previously underneath the building, downspouts directing roof discharge under the foundation, etc. Therefore, because of these unknown factors, the shrink/swell potential of soils in Texas can often be significantly underestimated using the previously mentioned methods of evaluating PVM.

The unknown factors previously mentioned cannot be determined at the time of the geotechnical study. Therefore, estimated shrink/swell movements are calculated only in consideration of historical climate data related to soil moisture variations for a particular area. Movements in excess of these assumed variations should be anticipated and regular maintenance should be provided to address these issues throughout the life of the structure.

3.2.2 DESIGN PVM CONSIDERATIONS

Grade-supported floor slabs and foundations should be expected to undergo some vertical movements, including differential, due to the action of expansive soils and possible soil settlement. In this general area, most owners, architects, structural and geotechnical engineers consider a value of one inch or less to be within acceptable movement tolerances for grade-supported floor slabs or foundations. This generally accepted tolerance for movement has been used by PSI in developing the recommendations for preparing the foundation pad for this project.

The amount of structural movement associated with a PVM magnitude of 1-inch may not be considered acceptable per “operational” or “aesthetic” performance criteria, which often occur at less movement than the magnitude of the PVM which is based on “structural” considerations. Cracking in the foundation and walls and sticking doors, which requires periodic maintenance, will likely occur for foundations designed using an allowable 1-inch PVM. This should be understood by the Owner and Design Team.

PSI recommends that the Owner discuss allowable movement tolerances with the structural engineer, architect, and all other members of the Design Team prior to commencement of the final design to make certain that appropriate movement tolerances are developed and used for this project. If design PVM values other than 1-inch is desired, PSI should be contacted to review and revise the recommendations presented in this report as necessary to meet the project requirements.

If the risk of grade-supported foundation and floor slab movements is not acceptable, or if the required foundation pad preparation costs for a soil-supported foundation are determined to be excessive, it is our opinion that a drilled pier foundation with a structurally suspended floor slab should be used. We would be pleased to provide geotechnical recommendations for this foundation type if desired.

3.3 FOUNDATION DISCUSSION

Based on information provided to PSI, information obtained during the field operations, results of the laboratory testing, and PSI’s experience with similar projects, recommendations for a drilled piers type foundation are presented in this report. If an alternative foundation type is desired, PSI can provide alternative recommendations in a supplemental letter upon request.

A potential for vertical movement greater than 1-inch is above the value considered acceptable by most structural and geotechnical engineers in this area. Therefore, foundation pad improvement is recommended to reduce the PVM to an acceptable value for the grade-supported floor slabs and shallow foundations proposed for this project.

3.3.1 Slab-on-Grade Earthwork Recommendations

Foundation pad improvement should consist of removing the upper soils to the recommended minimum over-excavation depth, compacting the exposed subgrade, placement and compaction of moisture conditioned common fill in areas between the top of the compacted subgrade up to the bottom of the select fill, and finally compaction of the select fill to finish floor grade. This procedure is outlined in the following sections.

3.3.1.1 *Reconditioning Method*

The following illustrations and tables provide general requirements for the installation of a foundation pad that should provide a PVM magnitude of 1 inch or less using the *Reconditioning Method*.

Table 3.1: Reconditioning Method Recommendations

Application	Soil-Supported Floor Slab
Site Stripping Removal	Upper 6 inches of organics and deleterious material including debris to expose clean subgrade
Foundation Improvement Method	Remove and replace existing soils with moisture conditioned soil and/or select fill
Improved Site Condition PVM	Approximately 1 inch
Minimum Over-Excavation	**4 feet**
Horizontal Undercut Extent	Below all slab areas and at least 5 feet beyond the slab perimeter and extending the full width of flatwork that may be sensitive to movement
Subgrade Proof-Rolling	Proof-roll subgrade with rubber tired 20-ton (loaded) construction equipment Alternate Equipment can be used with Geotechnical Engineer Approval Remove rutting or excessively deflecting soils Replace failing soils with compacted select fill material
Exposed Subgrade Treatment (Zone 3)	Proof-roll then scarify, moisture condition, and compact 9 inches subgrade below base of undercut
Select Fill Thickness (Zone 1)	**2 feet, plus as required to achieve bottom of slab elevation**
Select Fill Material (Other low plasticity materials may be used pending review and approval from PSI)	Pit Run Free of organics, trash, or other deleterious material Liquid Limit <40% Plasticity Index 7 to 20 Max Particle Size < 3” Percent Material Passing 200 Sieve > 35%
Select Fill Material Alternative	TxDOT Item 247 (Crushed Limestone Material) Type A or B Grade 1-2 or 3
Reconditioned Fill Minimum Thickness (Zone 2)	**2 feet**

Reconditioned Fill (Zone 2)	On site or imported materials having: Allowable PI from 12 to 50 Percent Passing No. 200 Sieve > 50% Max Particle Size < 3”
Structural Common Fill (Zone 4)	Clean on-site materials having: Allowable PI from 12 to 55 Percent Passing No. 200 Sieve > 35% Max Particle Size < 3”
Vapor Retarder Material	Approved by Architect and Structural Engineer
Maximum Loose Lift Thickness	8 inches
Time Between Reconditioned Fill and Select Fill Placement	Less than 48 hours

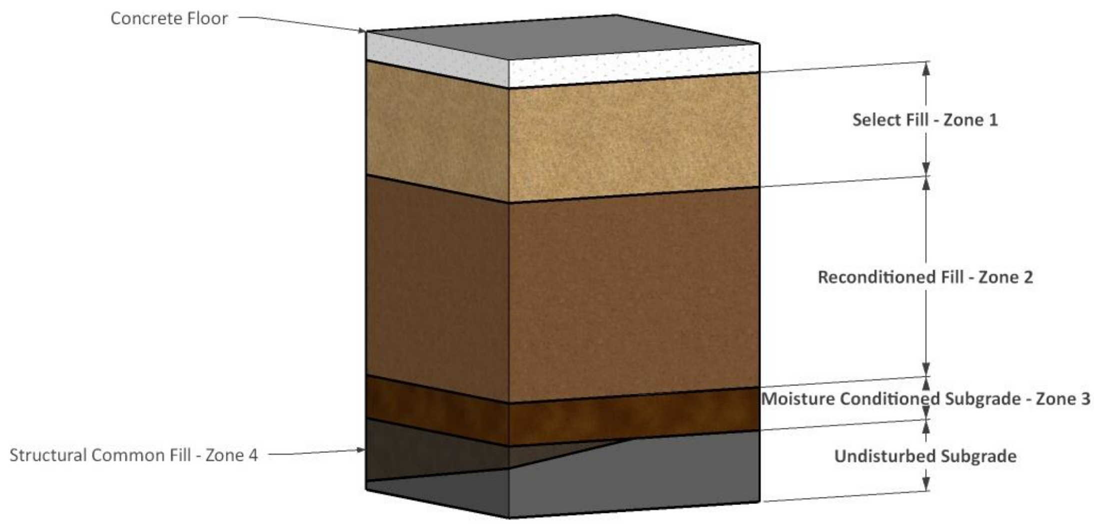


FIGURE 3.1: RECONDITIONING METHOD PAD IMPROVEMENT

3.3.2 Compaction and Testing Recommendations for Foundation Pad Areas

The following table outlines foundation pad compaction recommendations in consideration of appropriate vertical movement reduction method.

Table 3.2: Compaction Recommendations Reconditioning Method

Location	Material	Density Test Method	Plasticity Index	Percent Compaction	Optimum Moisture Content	Testing Frequency
Foundation Pad Areas	Subgrade, Reconditioned Fill, Structural Common Fill	ASTM D 698	PI ≥ 25	94% to 98%	≥ +2%	1 per 5,000 SF; min. 3 per lift
			PI < 25	≥ 95%	0 to +4%	
	Select Fill (Item 247 or Pit Run)	ASTM D 698	PI ≤ 20	≥ 95%	-1 to +3%	

3.4 Design Measures to Reduce Changes in Soil Moisture

The following recommended measures can reduce possible moisture fluctuations of the soils under the floor slab. Movements of the foundation soil can be effectively reduced by providing horizontal and/or vertical moisture barriers around the edge of the slab. Typically, the moisture barriers would consist of concrete flatwork or asphalt or concrete pavement placed adjacent to the edge of the building, a clay cap over poly, and/or a deepened perimeter grade beam or vertical trench filled with flowable fill.

Although subgrade modification is recommended to reduce potential soil-related foundation movements, the design and construction of a grade-supported foundation should also include the following elements:

- Roof drainage should be controlled by gutters and carried well away from the structure.
- The ground surface adjacent to the building perimeter should be sloped and maintained a minimum of 5% grade away from the building for 10 feet to result in positive surface flow or drainage away from the building perimeter. In areas adjacent to the building controlled by ADA, concrete flatwork slopes should not be more than 2% within 10 feet of the building.
- Hose bibs, sprinkler heads, and other external water connections should be placed well away from the foundation perimeter such that surface leakage cannot readily infiltrate into the subsurface or compacted fills placed under the proposed foundations and slabs.
- No trees or other vegetation over 6 feet in height shall be planted within 15 feet of the structure unless specifically accounted for in the foundation design.
- Utility bedding should not include gravel near the perimeter of the foundation. Compacted clay or flowable fill trench backfill should be used in lieu of permeable bedding materials between 2 feet inside the building to 4 feet beyond the exterior of the building edge to reduce the potential for water to infiltrate within utility bedding and backfill material.
- Paved areas around the structure are helpful in maintaining soil moisture equilibrium. It will be very beneficial to have pavement, sidewalks or other flatwork located immediately adjacent to the

building to both reduce intrusion of surface water into the more permeable select fill and to reduce soil moisture changes along the exterior portion of the floor due to soil moisture changes from drought, excessive rainfall or irrigation, etc. The use of a clay cap over poly sheeting (horizontal barrier) or impervious geosynthetic liner or concrete (vertical barrier) is recommended in those areas not covered with asphalt or concrete pavement or flatwork.

- Flower beds and planter boxes should be piped or watertight to prevent water infiltration under the building.
- Experience indicates that landscape irrigation is a common source of foundation movement problems and pavement distress. Repairing irrigation lines as soon as possible after leakage commences will benefit foundation performance greatly.
- Foundation pad and pavement subgrade should be protected and covered within 48 hours to reduce changes in the natural moisture regime from rainfall events or excessive drying from heat and wind.

3.5 FOUNDATION DESIGN RECOMMENDATIONS

3.5.1 DRILLED PIER RECOMMENDATIONS

Drilled shafts are the recommended foundation system for this project. The axial load carrying capacity of a drilled shaft can be computed using the static method of analysis. According to this method, axial capacity, Q, at a given penetration is taken as the sum of the skin friction on the side of the shaft, Q_f, and the end or point bearing at the shaft tip, Q_{eb}, so that:

$$\mathbf{Q = Q_f + Q_{eb} = f \cdot A_s + q \cdot A_p}$$

where A_s and A_p represent, respectively, the embedded surface area and the end area of the shaft; f and q represent, respectively, the unit skin friction and the unit end or point bearing.

The total allowable axial capacity in compression will be the summation of the allowable frictional capacity and the allowable end bearing capacity. The total allowable axial capacity in tension will be the allowable frictional capacity alone neglecting end bearing component.

3.5.1.1 *STRAIGHT DRILLED PIER*

PSI recommends that the building be supported on deep straight shaft drilled piers to minimize the potential for undesirable settlement and to reduce potential foundation movements as the structure support will be based below the seasonal active zone. The following illustrations and tables outline the requirements for drilled shaft design and construction considerations for support of these structures.

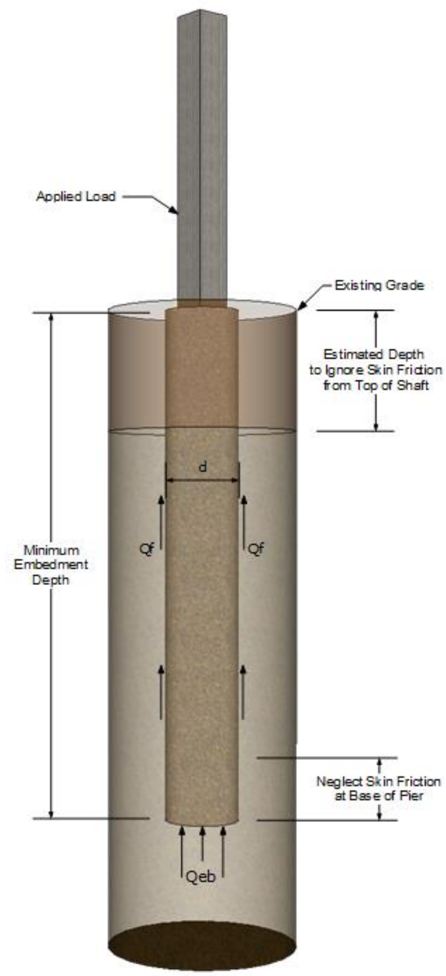


FIGURE 3.2: STRAIGHT DRILLED PIER

TABLE 3.3: PARAMETERS FOR AXIAL DESIGN

Material	Depth, feet	Allowable Unit Skin Friction, psf (F.S. = 2)	Allowable Unit End Bearing, psf (F.S. = 3)	Uplift Force of Soil, kips
Clay	0 to 5	—	—	35d with d in feet
Clay	5 to 33.5	800	—	
Shale	33.5 to 70	1,500	20,000	

TABLE 3.4: CONSTRAINTS FOR STRAIGHT SHAFT DESIGN

Neglect Skin Friction from Top of Shaft	5 feet
Minimum Embedment Depth below Original Grade	Min 3*d embedment into clay-shale, shale
Minimum Shaft Diameter, d	18 inches
Thickness to Neglect Skin Friction at Base of Shaft	1 Shaft Diameter

Uplift Resistance	Pier Weight + Dead Load + Allowable Skin Friction Below Active Zone
Minimum Shaft Spacing (center to center)	3 Shaft Diameters (3·d)
Possible Group Effect	If spacing < 3d consult Geotechnical Engineer
Min. Pier Vertical Reinforcing Steel	1% of gross cross-sectional area and as needed to resist uplift forces
Pier Tensile Reinforcing Steel	As Per ACI Code
Estimated Settlement Total Settlement Differential Settlement	 Less than 1 inch Less than 0.5 inch

Notes: Detailed Settlement Analysis is outside project scope

The minimum embedment depth was selected to locate the pier base below the depth of seasonal moisture change and within a specified desired stratum. Actual pier depths may need to be deeper depending upon the actual compressive loads on the pier.

3.5.1.2 *LPILE DESIGN CRITERIA*

Piers having lateral loads should be designed utilizing the following LPILE input parameters for this project.

TABLE 3.5: PARAMETERS FOR LATERAL DESIGN USING LPILE

'p-y' Criteria	Depth, feet	γ_e, pcf	c, psf	q_u, psi	k_s, pci	k_c, pci	E, psi (10^6)	RQD, %	ε_{50} or k_{rm}
Stiff Clay	0 to 5	105	1,000	-	225	100	-	-	0.007
Stiff Clay	5 to 33.5	110	1,500	-	500	200	-	-	0.005
Weak Rock	33.5 to 70	140	-	100	-	-	0.15	80	0.0005

Note: γ_e: Effective Soil Unit Weight
c: Undrained Cohesion for Clay
q_u: Uniaxial Compression Strength for Rock
k_s: Clay Static Loading Modulus of Subgrade Reaction (LPILE Manual Table 3-3)
k_c: Clay Cyclic Loading Modulus of Subgrade Reaction (LPILE Manual Table 3-3)
E: Initial Modulus of Rock Mass (LPILE Manual Figure 3-45)
RQD: Rock Quality Designation
ε_{50}: Axial Strain Factor for Soil (LPILE Manual Table 3-2 and 3-4)
k_{rm}: Axial Strain Factor for Rock (0.0005 Recommended)

3.5.1.3 *GENERAL PIER CONSTRUCTION RECOMMENDATIONS*

TABLE 3.6: DRILLED PIER INSTALLATION CONSIDERATIONS

Recommended Installation Procedure	FHWA-NHI-10-016, May 2010
High-Torque Drilling Equipment Anticipated	Yes
Groundwater Anticipated	Possible, Not Encountered During Drilling
Verification of Groundwater before Installation	Yes
Temporary Casing Anticipated	No
Concrete Placement after Drilling	Same Day as drilling. If concrete cannot be poured the same day as excavation, temporary casing or slurry may be needed to maintain an open excavation. Concrete should not be allowed to ricochet off the pier reinforcing steel nor off the side walls of excavation.
Concrete Slump	7 inches ± 1 inch
Permissible Water Accumulation in Excavation	Less than 2 inches
Concrete Installation Method for Water Infiltration	Tremie or pump to displace water
Reinforcing and Excavation to Cage Separation	3 times maximum size of coarse aggregate
Centralizers Recommended for Reinforcement	Yes
Cross Bracing within Reinforcement Cage	Not Recommended
Quality Assurance Monitoring by Geotechnical Engineer or Representative	Observe drilling of all piers During drilling, record tip of shaft depth Observe base material and cleanliness of base Observe placement of reinforcement

3.5.1.4 *GENERAL RECOMMENDATIONS FOR PIER SLAB-ON-GRADE*

The design of grade-supported floor slab should take into consideration the interaction between the slab and the supporting soils to resist moments and shears induced by applied loads. Several design methods use the modulus of subgrade reaction, k, to account for soil properties. The k values presented in the following table can be used for the design of flat, grade-supported floor slabs for this project. **These k values assume that at least 1.5 feet of the floor support material has been placed and properly compacted immediately beneath the slab.**

TABLE 3.7: RECOMMENDED K VALUES

Floor Support Material	k, pci
Crushed Limestone Base	225
Pit Run Select Fill	125
Natural Clay Subgrade	75

3.6 SIDEWALKS AND FLATWORK

For sidewalks or other flatwork located adjacent to grade-supported foundations, the undercutting and select fill placement operations for the building should extend beyond the perimeter of the building and pavements to at least the width of the adjacent sidewalk or flatwork.

Any other sidewalks or flatwork not adjacent to buildings should be placed on an improved subgrade meeting or exceeding the pavement subgrade improvement methods previously recommended. If the sidewalk subgrade consists of material with a plasticity index of 25 or greater, a 12-inch-thick layer of material satisfying the requirements of select fill provided in Section 3.3.1 must be placed below the sidewalk. The material should be compacted to 95% or greater than the maximum dry unit weight and contain a moisture content between -1 and +3% optimum moisture content.

Proper drainage around grade-supported sidewalks and flatwork is also very important to reduce potential movements. Elevating the sidewalks where possible and providing rapid, positive drainage away from them will reduce moisture variations within the underlying soils and will therefore provide valuable benefit in reducing the full magnitude of potential movements from being realized.

3.7 SITE SEISMIC DESIGN RECOMMENDATIONS

For the purposes of seismic design, based on the encountered site conditions and local geology, PSI interpreted the subsurface conditions to satisfy the **Site Class D** criteria for use at this site as defined by the International Building Code (IBC). The site class is based on the subsurface conditions encountered at the soil borings, the results of field and laboratory testing, experience with similar projects in this area, and considering the site prepared as recommended herein. The table below provides recommended seismic parameters for the project based on the 2021 edition of the IBC.

TABLE 3.8: RECOMMENDED DESIGN SEISMIC PARAMETERS

Project/Structure Centroid Coordinates (WGS84 - Decimal Degree)	**30.28065 °, -97.74986 °**
Seismic Parameter	**IBC 2021/ASCE 7-16**
Site Class	D
Risk Category	II
0.2 sec (S_S)	0.053g
1.0 sec (S_1)	0.031g
Site Coefficient 0.2sec, F_a	1.6
Site Coefficient 1.0 sec, F_v	2.4
0.2 sec (S_{DS})	0.056g
1.0 sec (S_{D1})	0.049g

4.0 PAVEMENT DESIGN RECOMMENDATIONS

4.1 PAVEMENT DESIGN PARAMETERS

PSI understands that flexible and rigid pavements will be considered for this project. Therefore, pavement design recommendations for several levels of traffic loading were developed based on assumptions of potential traffic, drive paths or patterns and anticipated soil support characteristics of pavement subgrades. PSI utilized the "AASHTO Guide for Design of Pavement Structures" published by the American Association of State Highway and Transportation Officials to evaluate the pavement thickness recommendations in this report. This method of design considers pavement performance, traffic, roadbed soil, pavement materials, environment, drainage and reliability. Each of these items is incorporated into the design methodology. *PSI is available to provide laboratory testing and engineering evaluation to refine the site-specific design parameters and sections, upon request.*

Specific design traffic types and volumes for this project were not available to PSI at the issuance of this report. This traffic information is typically used to determine the number of 18-kip Equivalent Single Axle Loads (ESAL) that is applied to the pavement over its design life. Furthermore, the scope of services for this project did not include California Bearing Ratio (CBR) testing. In lieu of project specific design parameters, general traffic and subgrade parameter assumptions were used for this design. Based on this information, PSI has provided recommended pavement sections for "light duty", and "heavy duty" pavements constructed on stable and properly prepared/compacted subgrades. Flexible pavement options with and without geogrid options are also provided for consideration. Details regarding the basis for this design are presented in the table below.

TABLE 4.1: PAVEMENT DESIGN PARAMETERS AND ASSUMPTIONS (RIGID AND FLEXIBLE)

Reliability, percent	75
Initial Serviceability Index, Flexible Pavement	4.2
Initial Serviceability Index, Rigid Pavement	4.5
Terminal Serviceability Index	2.0
Traffic Load for Light Duty Pavement	15,000 equivalent single axle loads (ESALs)
Traffic Load for Heavy Duty Pavement	150,000 equivalent single axle loads (ESALs)
Standard Deviation, Flexible Pavement	0.45
Standard Deviation, Rigid Pavement	0.35
Concrete Compressive Strength	3,500 psi
Subgrade California Bearing Ratio (CBR)	2.0 for high plasticity clay subgrade
Subgrade Modulus of Subgrade Reaction, k in pci	75 for high plasticity clay subgrade

Asphaltic concrete pavements founded on top of expansive soils will be subjected to PVM soil movements estimated and presented in this report. These potential soil movements are typically activated to some degree during the life of the pavement. Consequently, pavements can be expected to crack and require periodic maintenance to reduce damage to the pavement structure.

Light duty areas include parking and drive lanes that are subjected to passenger vehicle traffic only and exclude entrance aprons and general and single access roadway drives to the parking lot area. Heavy duty areas include areas subjected to 18-wheel tractor trailers, including loading and unloading areas, and areas where truck turning and maneuvering may occur.

Eight-inch-thick concrete pavement is recommended for dumpster pad areas and that area leading up to the dumpster pad.

During the paving life, maintenance to seal surface cracks within concrete or asphalt paving and to reseal joints within concrete pavement should be undertaken to achieve the desired paving life. Perimeter drainage should be controlled to prevent or retard influx of surface water from areas surrounding the paving. Water penetration leads to paving degradation. Water penetration into base or subgrade materials, sometimes due to irrigation or surface water infiltration leads to pre-mature paving degradation. Curbs should be used in conjunction with asphalt paving to reduce potential for infiltration of moisture into the base course. Curbs should extend the full depth of the base course and should extend at least 3 inches into the underlying clayey subgrade. The base layer should be tied into the area inlets to drain water that may collect in the base.

Material specifications, construction considerations, and section requirements are presented in following sections.

The presented recommended pavement sections are based on the field and laboratory test results for the project, local pavement design practice, design assumptions presented herein and previous experience with similar projects. The project Civil Engineer should verify that the ESAL and other design values are appropriate for the expected traffic and design life of the project. PSI should be notified in writing if the assumptions or design parameters are incorrect or require modification.

4.2 PAVEMENT SECTION RECOMMENDATIONS

PSI anticipated that the roadways and parking areas will be used primarily by passenger vehicles and delivery vehicles. PSI is providing parking and drive area sections based on experience with similar facilities constructed on similar soil conditions for the design traffic loading anticipated.

4.2.1 FLEXIBLE PAVEMENT

The proposed roadways and parking areas for this project may be constructed with flexible asphaltic concrete pavement. Recommendations for flexible asphaltic concrete pavement for roadways and parking areas are provided below.

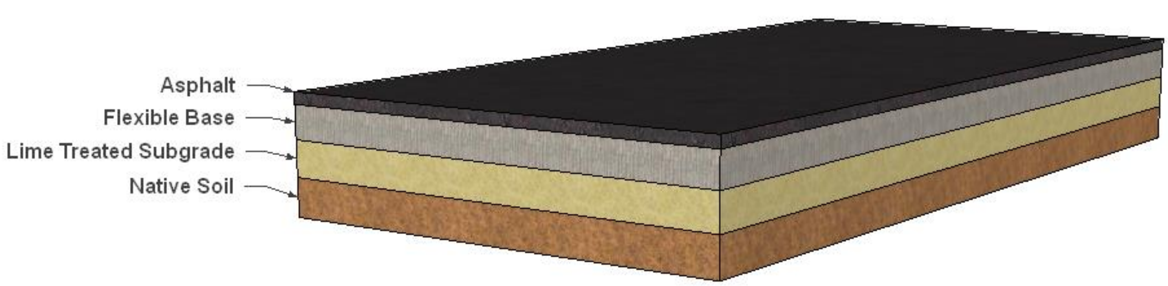


FIGURE 4.1: OPTION 1 FLEXIBLE PAVEMENT TYPICAL SECTION

FIGURE 4.2: OPTION 2 FLEXIBLE PAVEMENT TYPICAL SECTION

TABLE 4.2: FLEXIBLE PAVEMENT SECTION OPTIONS

Material	Option 1		Option 2	
Traffic Type	Light	Heavy	Light	Heavy
Hot Mix Asphaltic Concrete	2”	3”	2”	3”
Import Flexible Base	7”	10”	7”	10”
Lime Stabilized Subgrade	8”		No	
Geogrid	No		Yes	
Compacted Subgrade	—		8”	

4.2.2 RIGID PAVEMENT

The proposed roadways and parking areas for this project may also be constructed with rigid concrete pavement. Recommendations for rigid concrete pavement for roadways and parking areas are provided below.

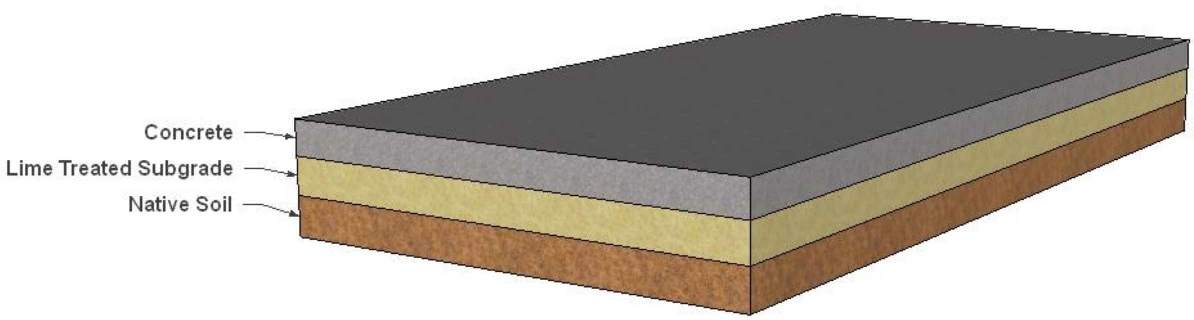


FIGURE 4.3: OPTION 1 RIGID PAVEMENT TYPICAL SECTION

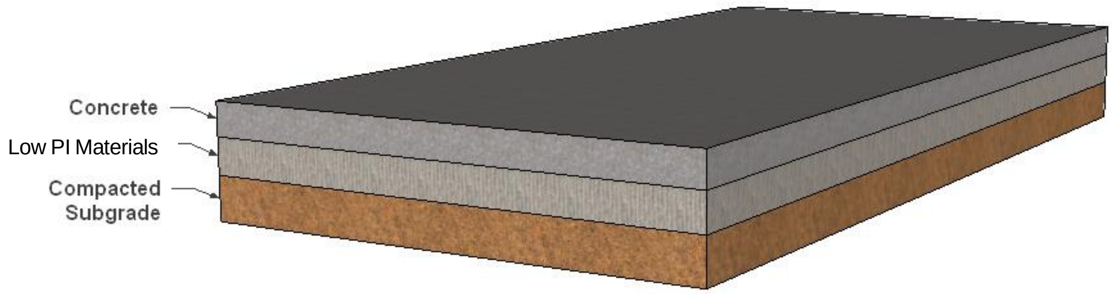


FIGURE 4.4: OPTION 2 RIGID PAVEMENT TYPICAL SECTION

TABLE 4.3: RIGID PAVEMENT SECTION OPTIONS

Material	**Option 1**		**Option 2**	
Traffic Type	Light	Heavy	Light	Heavy
Portland Cement Concrete	5”	7”	5”	7”
Low PI Material	–	–	8”	8”
Lime Stabilized Subgrade	8”		–	
Compacted Subgrade	–		8”	

4.2.3 GENERAL PAVEMENT DESIGN AND CONSTRUCTION RECOMMENDATIONS

TABLE 4.4: PAVEMENT DESIGN AND CONSTRUCTION RECOMMENDATIONS

Minimum Undercut Depth	6 inches or as needed to remove roots
Reuse Excavated Soils	Must be free of roots and debris and meet material requirements of intended use
Undercut Extent	2 feet beyond the paving limits
Exposed Subgrade Treatment	Proof-roll subgrade with rubber tired 20-ton (loaded) construction equipment Alternate Equipment can be used with Geotechnical Engineer Approval
Proof-Rolled Pumping and Rutting Areas	Excavate to firmer materials and replace with compacted general or select fill under direction of a representative of the Geotechnical Engineer
General Fill	Materials free of roots, debris, and other deleterious materials with a maximum rock size of 4 inches with a CBR greater than 3
Minimum General Fill Thickness	As required to achieve grade
Maximum General Fill Loose Lift Thickness	9 Inches
Lime Stabilization	Performed in general accordance with TxDOT Item 260. Upper 8 inches of subgrade stabilized with lime to achieve pH of 12.4 or greater. Sulfate testing should be conducted before placement of lime.

Low PI Material (Other low plasticity materials may be used pending review and approval from PSI)	On-Site or Imported Free of organics, trash, or other deleterious material Plasticity Index 12 to 25 Max Particle Size < 3” % passing #200 sieve > 35%
Geogrid	Geogrid must meet TxDOT Item DMS - 6240. Subgrade should be leveled and smoothed prior to geogrid placement on compacted subgrade.
Imported Flexible Base	TxDOT Item 247, Type A, Grade 1 or 2
Maximum Flexible Base Loose Lift Thickness	9 Inches
Hot Mix Asphaltic Concrete	TxDOT Item 340, Type D
Concrete Minimum Recommended Strength	4,000 psi (avg. 28-day comp. strength)
Concrete Contraction Joint Min. Reinforcement (Intended to assist in countering cracking and swelling soil pressures)	No. 3 bars at 18-inch on center each way Located in top half of concrete section Minimum 2 inches cover
Concrete Construction Joint Min. Reinforcement	12” On Center Spaced, 14” Long, ¾” Diameter Dowels
Contraction Joint Spacing (In General Accordance with ACI 330)	Maximum joint spacing should be less than 30 times the thickness of the concrete pavement or 15 feet, whichever is smaller.

TABLE 4.5: COMPACTION AND TESTING RECOMMENDATIONS FOR PAVEMENT AREAS

Location	Material	Density Test Method	Soil Type	Percent Compaction	Optimum Moisture Content	Testing Frequency
Pavement Areas	Subgrade General Fill Soil Low PI Material	ASTM D 698	PI ≥ 25	94% to 98%	0 to +4%	1 per 10,000 SF; min. 3 tests
			PI < 25	≥ 95%	0 to +4%	
	Base Material	ASTM D 1557	Item 247	≥ 95%	±3%	1 per 5,000 SF; min. 3 per lift
		TEX-113-E	Item 247	≥ 100%	±2%	

Notes: Flexible Base for concrete pavement should be placed at ≥ 95% D698 and within +3% of OMC

5.0 CONSTRUCTION CONSIDERATIONS

Geotechnical Engineer Involvement at the Time of Construction – Foundation pad preparation requirements on expansive clay sites depend on the soil moisture condition due to the prevailing climate at the time of construction in addition to the expansive properties of the clay. It is recommended that the foundation pad recommendations presented in this report be confirmed immediately prior to construction by a Geotechnical Engineer. Wetter climate conditions near the time of construction can lead to a significant reduction in pad preparation requirements which are often a substantial percentage of site development cost.

Having a Geotechnical Engineer retained to review the earthwork recommendations in the Contract Documents and be an active participant in team meetings near the time of construction can often result in project cost savings. Therefore, PSI recommends that an AASHTO accredited 3rd party laboratory with qualified professional engineers who specialize in geotechnical engineering be retained to provide observation and testing of construction activities involved in the foundations, earthwork, pavements and related activities of this project. As the Geotechnical Engineer of Record, PSI's services can be retained as the 3rd party laboratory. PSI's participation would be advantageous to project flow and value engineering during construction.

The geotechnical engineer can assess soil conditions at the time of construction more accurately by knowing the location of the building, surrounding flatwork, pavements, planned landscaping, and drainage features often resulting in less risk and project cost savings.

PSI cannot accept responsibility for conditions which deviate from those described in this report, nor for the performance of the foundations or pavements if not engaged to also provide construction observation and materials testing for this project. The PSI geotechnical engineer of record must also be engaged by the Design Team, even if periodic on-call testing is contracted with PSI Construction Services.

5.1 INITIAL SITE PREPARATION CONSIDERATIONS

5.1.1 SUBGRADE PREPARATION FOR SITE WORK OUTSIDE BUILDING PAD AND PAVEMENT AREAS

Grade adjustments outside of the foundation pad and pavement areas can be made using select or general fill materials. The clean excavated onsite soils may also be reused in areas not sensitive to movement.

TABLE 5.1: SUBGRADE PREPARATION FOR NON-STRUCTURAL - GENERAL FILL

Minimum Undercut Depth	4 inches or as needed to remove roots, organic and/or deleterious materials
Exposed Subgrade Treatment	Proof-roll subgrade with rubber tired 20-ton (loaded) construction equipment Alternate Equipment can be used with Geotechnical Engineer Approval
Proof-Rolled Pumping and Rutting Areas	Excavate to firmer materials and replace with compacted general or select fill under direction of a representative of the Geotechnical Engineer
General Fill Type	Any clean material free of roots, debris and other deleterious material with a maximum particle size of 4 inches
Maximum General Fill Loose Lift Thickness	8 inches

TABLE 5.2: FILL COMPACTION RECOMMENDATIONS OUTSIDE OF BUILDING AND PAVEMENT AREAS

Location	Material	Test Method for Density Determination	Plasticity Index	Percent Compaction	Optimum Moisture Content	Testing Frequency
Outside of Structure / Pavement Areas	General Fill	ASTM D 698	PI ≥ 25	94% to 98%	0 to +4%	1 per 10,000 SF; min. 3 per lift
			PI < 25	≥ 95%	0 to +4%	

5.1.2 *EXISTING SITE CONDITIONS*

The following table outlines construction considerations in consideration of demolition of existing structures, demolition of existing paving, procedures for abandoning old utility lines and removing trees.

TABLE 5.3: CONSIDERATIONS FOR DEMOLITION

Existing Structures	
Foundations of former structure(s) located below new structure	Impact of foundation of former structures should be evaluated on a case by case basis
Foundations for former structure(s) located below new paving	Cut off at least 3 feet below finished paving grade
Existing Pavement	
Former paving located within footing of proposed structure(s)	Remove concrete and/or HMAC surface course and base entirely or review impact on case by case basis
Former paving located within footprint of proposed new paving	Remove concrete and/or HMAC surface course and evaluate if base can be reused
Abandoned Utilities	
Utilities of former structure(s) located within new foundation pad/footprint of proposed structure	Remove pipe, bedding and backfill and then replace with select fill placed using controlled compaction
Utilities of former structure(s) located outside of foundation pad footprint	Abandon in place using a grout plug
Tree Removal	
Trees located within proposed building footprint; roadways, parking, and sidewalk areas; and 5 feet of building area	Remove root system for full vertical and lateral extent and extend removal for at least 3 feet beyond presence of root fragments and replace void with compacted general fill or flowable fill

5.2 MOISTURE SENSITIVE SOILS/WEATHER RELATED CONCERNS

Soils are sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils which become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork, foundation, and construction activities during dry weather. A relatively all-weather compacted crushed limestone cap having a thickness of at least 6 inches should be provided as a working surface.

5.3 EXCAVATION OBSERVATIONS

Excavations should be observed by a representative of PSI prior to continuing construction activities in those areas. PSI needs to assess the encountered materials and confirm that site conditions are consistent with those discussed in this report. This is especially important to identify the condition and acceptability of the exposed subgrades under foundations and other structures that are sensitive to movement. Soft or loose soil zones encountered at the bottom of the excavations should be removed to the level of competent soils as directed by the Geotechnical Engineer or their representative. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with compacted select fill or lean concrete.

After opening, excavations should be observed and concrete should be placed as quickly as possible to avoid exposure to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. Excavations left open for an extended period of time (greater than 24 hours) should be protected to reduce evaporation or entry of moisture.

5.4 DRAINAGE CONSIDERATIONS

Water should not be allowed to collect in foundation excavations, on foundation surfaces, or on prepared subgrades within the construction area during or after construction. Proper drainage around grade-supported sidewalks and flatwork is important to reduce potential movements. Excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Providing rapid, positive drainage away from the building reduces moisture variations within the underlying soils and will aid in reducing the magnitude of potential movements.

5.5 EXCAVATIONS AND TRENCHES

Excavation equipment capabilities and field conditions may vary. Geologic processes are erratic and large variations can occur in small vertical and/or lateral distances. Details regarding “means and methods” to accomplish the work (such as excavation equipment and technique selection) are the sole responsibility of the project contractor. The comments contained in this report are based on small diameter borehole observations. The performance of large excavations may differ as a result of the differences in excavation sizes.

The Shale Stratum encountered in the borings is hard. Excavations penetrating the shale and shale removal as part of site grading will likely require high-powered, heavy-duty rock excavation equipment.

The Occupational Safety and Health Administration (OSHA) Safety and Health Standards (29 CFR Part 1926, Revised October 1989), require that excavations be constructed in accordance with the current OSHA guidelines. Furthermore, the State of Texas requires that detailed plans and specifications meeting OSHA standards be prepared for trench and excavation retention systems used during construction. PSI understands that these regulations are being strictly enforced, and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and Federal safety regulations.

PSI is providing this information as a service to the client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and Federal safety or other regulations. A trench safety plan was beyond the scope of our services for this project.

6.0 REPORT LIMITATIONS

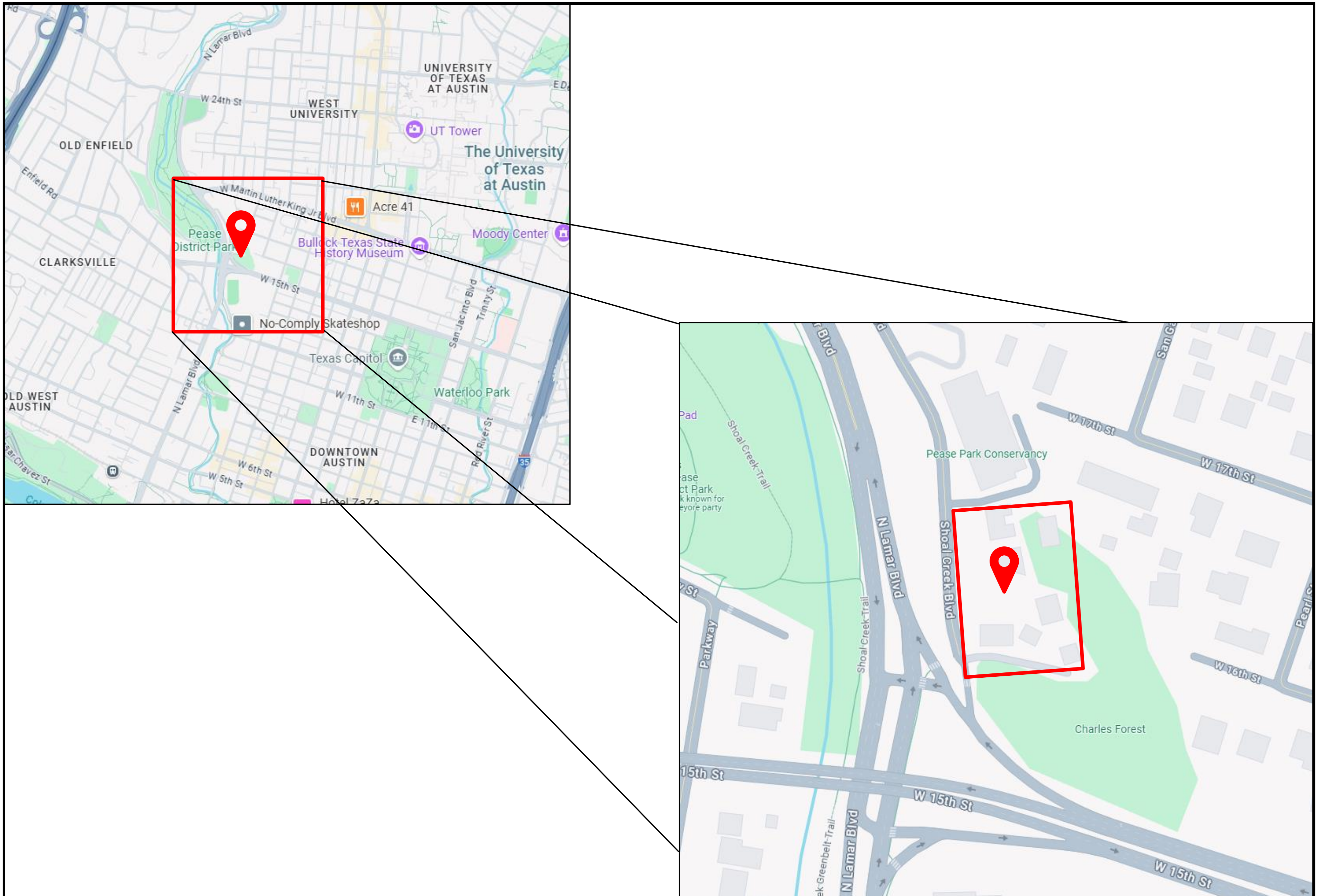
The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by the client for the proposed project. If there are revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional Geotechnical Engineering practices in the local area. No other warranties are implied or expressed. This report may not be copied without the expressed written permission of PSI.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that the engineering recommendations have been properly incorporated in the design documents. At this time, it may be necessary to submit supplementary recommendations. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

This report has been prepared for the exclusive use of Shoal Creek Development, LLC for specific application to the proposed Shoal Creek Condominiums to be constructed at 1501 Shoal Creek Boulevard in Autin, Texas.

APPENDIX

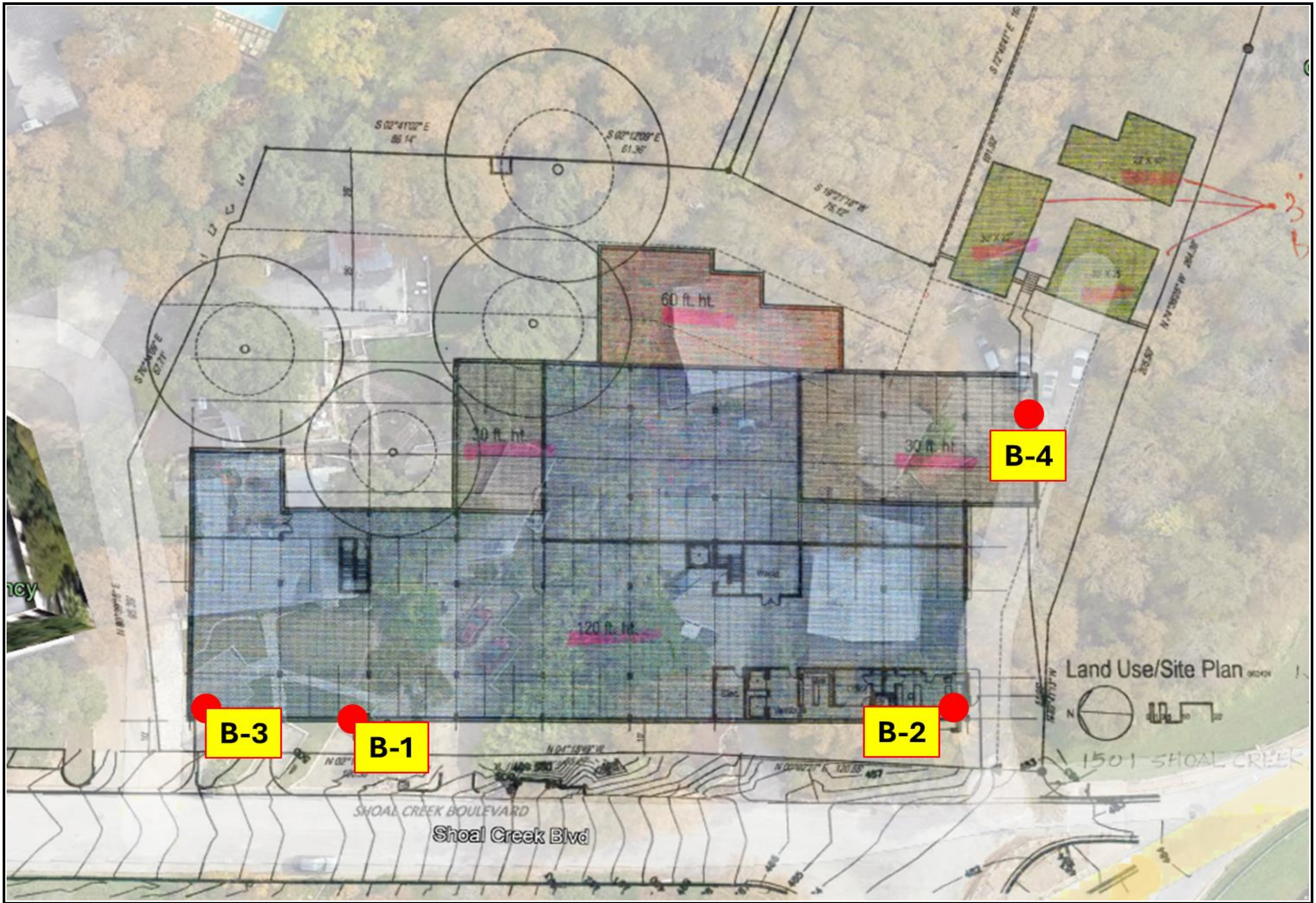


intertek psi

2600 McHale Ct. #125
Austin, Texas 78758
(512) 491-0200

Site Vicinity Map
PSI Project No.: 03031973

Shoal Creek Condominiums
1501 Shoal Creek Boulevard
Austin, Texas



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Boring Location Plan
PSI Project No.: 03031973

Shoal Creek Condominiums
1501 Shoal Creek Boulevard
Austin, Texas

Boring Logs

Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

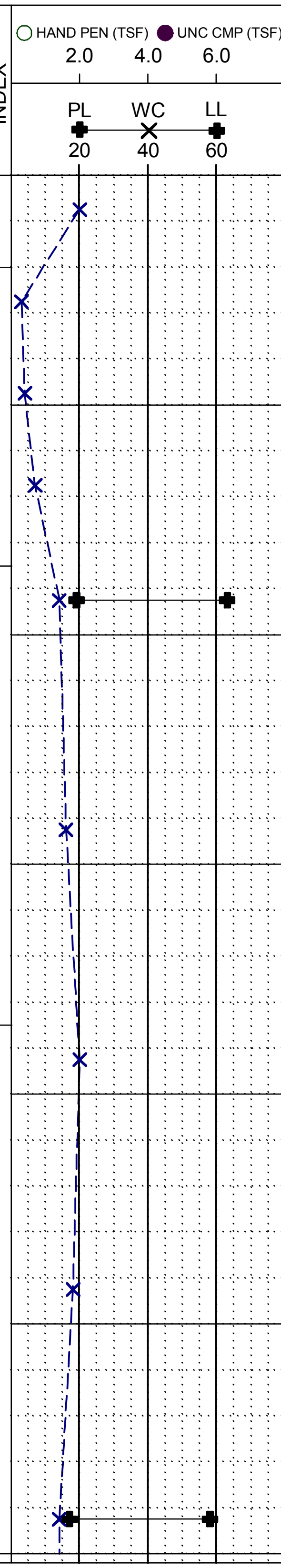
BORING B-1

LOCATION: Lat: 30.2811°, Long: -97.7501°

Elevation: 503.00

SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
FAT CLAY with SAND (CH), very stiff, dark brown	20			26							
CLAYEY SAND with GRAVEL (SC), medium dense to dense, light brown	3			40							
	4			28							
	7			44							
FAT CLAY with SAND (CH), stiff to hard, brown	14	7	83	11			63	19	44		
	16			24							
FAT CLAY (CH), hard, gray	20			28							
	18			31							
	14	3	90	62			58	17	41		

DEPTH, FT.: 5, 10, 15, 20, 25, 30



COMPLETION DEPTH: 70.0 Feet
DATE: 4/24/25-2/24/25

intertek psi

DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered
DELAYED WATER LEVEL (FT): N/A

Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

BORING B-1

LOCATION: Lat: 30.2811°, Long: -97.7501°

DEPTH, FT.	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
	FAT CLAY (CH), hard, gray											
	SHALE, hard, gray	14			50/4"							
35	SHALE, gray											
	- fairly continuous recovery and fair quality from 35 ft to 40 ft					83	62				14	140
40	- continuous recovery and good quality from 40 ft to 45 ft					90	83					
45	- continuous recovery and excellent recovery from 45 ft to 50 ft					100	90				7	143
50	- continuous recovery and poor quality from 50 ft to 55 ft					100	43					
55	- continuous recovery and fair quality from 55 ft to 60 ft					100	72					
60												

Graph legend: HAND PEN (TSF) / UNC CMP (TSF): 2.0, 4.0, 6.0; PL, WC, LL: 20, 40, 60; >>

COMPLETION DEPTH: 70.0 Feet
DATE: 4/24/25-2/24/25

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DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered

Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

BORING B-1

LOCATION: Lat: 30.2811°, Long: -97.7501°

DEPTH, FT.	SYMBOL	SAMPLES	WATER	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	HAND PEN (TSF) / UNC CMP (TSF) 2.0 4.0 6.0; PL WC LL 20 40 60	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
				SHALE, gray												
				- continuous recovery and fair quality from 60 ft to 65 ft					98	68				>>	40	155
65																
									75	60						
				- fairly continuous recovery and fair quality from 65 ft to 70 ft												
70				- Boring terminated at approximately 70 ft												
75																
80																
85																
90																

COMPLETION DEPTH: 70.0 Feet
DATE: 4/24/25-2/24/25

DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered

Shoal Creek Condos

1501 Shoal Creek Boulevard, Austin, Texas

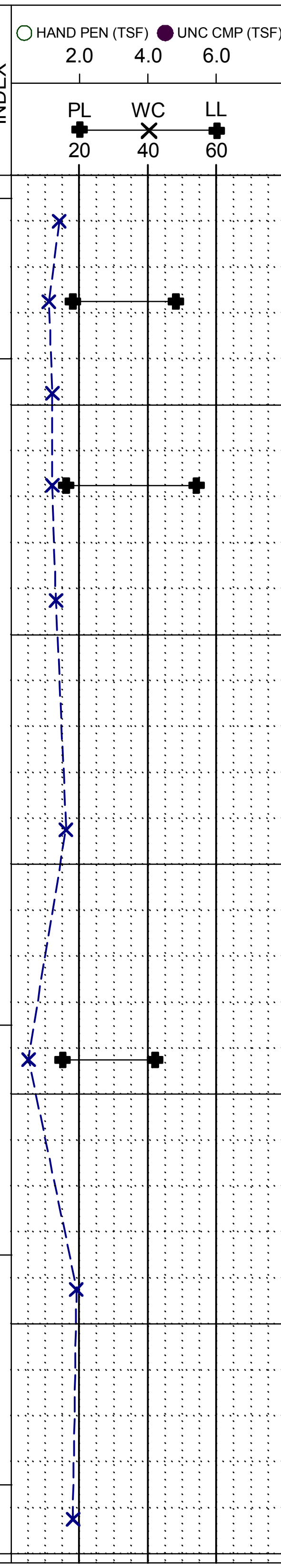
Project No. 03031973

BORING B-2

LOCATION: Lat: 30.2806°, Long: -97.7499°

Elevation: 484.00

DEPTH, FT.	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
	2 inches Asphalt, 4 inches Base											
	LEAN CLAY with SAND (CL), very stiff, brown	14			17							
		11	1	83	22			48	18	30		
5	FAT CLAY with SAND (CH), stiff to very stiff, light brown	12			27							
		12	5	80	27			54	16	38		
		13			25							
10												
		16			27							
15												
	CLAYEY GRAVEL with SAND (GC), dense, brown	5	50	23	45			42	15	27		
20												
	FAT CLAY (CH), very stiff, brown	19			27							
25												
	SHALE, hard, gray	18			50/3"							
30												



COMPLETION DEPTH: 50.0 Feet

DATE: 2/24/25-2/24/25

DEPTH TO GROUND WATER

SEEPAGE (ft.): Not Encountered

END OF DRILLING (ft.): Not Encountered

DELAYED WATER LEVEL (FT): N/A

intertek psi

Shoal Creek Condos

1501 Shoal Creek Boulevard, Austin, Texas

Project No. 03031973

BORING B-2

LOCATION: Lat: 30.2806°, Long: -97.7499°

DEPTH, FT.	SYMBOL	SAMPLES	WATER	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	○ HAND PEN (TSF) ● UNC CMP (TSF) 2.0 4.0 6.0 / PL WC LL 20 40 60	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
				SHALE, gray												
									88	49				>> ●	72	152
				- fairly continuous recovery and poor quality from 30 ft to 35 ft												
35																
									95	17						
40				- continuous recovery and very poor quality from 35 ft to 50 ft												
									100	0						
45																
									95	27						
50				- Boring terminated at approximately 50 ft												
55																
60																

COMPLETION DEPTH: 50.0 Feet

DATE: 2/24/25-2/24/25

intertek psi

DEPTH TO GROUND WATER

SEEPAGE (ft.): Not Encountered

END OF DRILLING (ft.): Not Encountered

Shoal Creek Condos

1501 Shoal Creek Boulevard, Austin, Texas

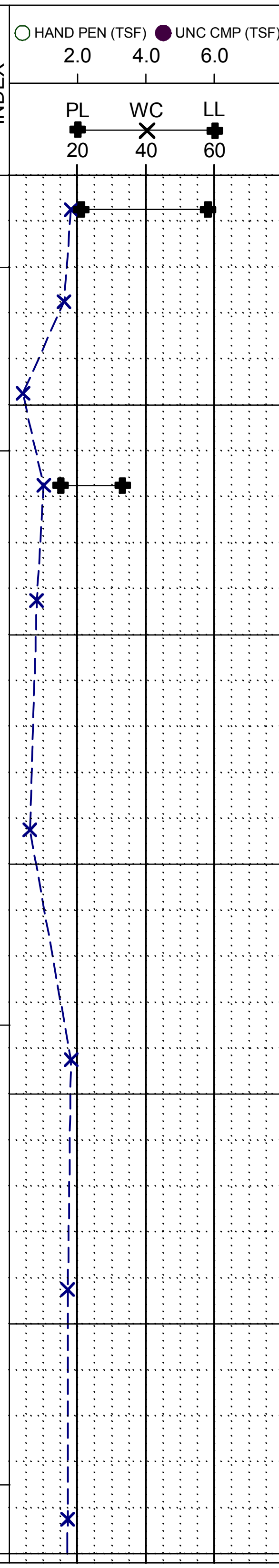
Project No. 03031973

BORING B-3

LOCATION: Lat: 30.2813°, Long: -97.7497°

Elevation: 508.00

SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
FAT CLAY with SAND (CH), stiff, dark brown	18	15	70	12			58	21	37		
GRAVELLY LEAN CLAY with SAND (CL), very stiff, brown	16			29							
	4			40							
FAT CLAY with SAND (CH), very stiff to hard, light brown	10	21	54	28			33	15	18		
	8			35							
	6			23							
FAT CLAY (CH), hard, light brown	18			35							
	17			35							
SHALE, hard, gray	17			46							



COMPLETION DEPTH: 50.0 Feet

DATE: 2/24/25-2/24/25

intertek psi

DEPTH TO GROUND WATER

SEEPAGE (ft.): Not Encountered

END OF DRILLING (ft.): Not Encountered

DELAYED WATER LEVEL (FT): N/A

Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

BORING B-3

LOCATION: Lat: 30.2813°, Long: -97.7497°

DEPTH, FT.	SYMBOL	SAMPLES	WATER	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	HAND PEN (TSF) / UNC CMP (TSF) 2.0 4.0 6.0; PL WC LL 20 40 60	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
				SHALE, hard, gray												
		X			16			63								
35																
		X			13	1	93	50/5"			54	17	37			
40																
		X			13			50/4"								
45																
		X			11			50/5"								
50				- Boring terminated at approximately 50 ft												
55																
60																

COMPLETION DEPTH: 50.0 Feet
DATE: 2/24/25-2/24/25

intertek psi

DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered

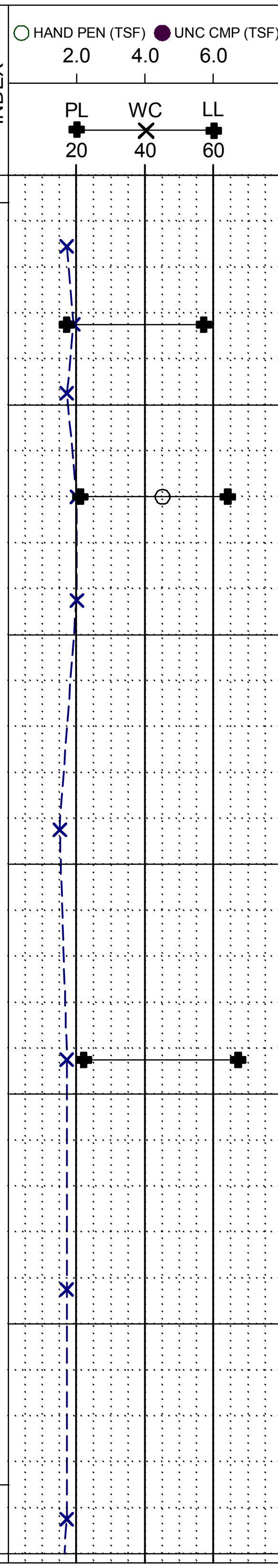
Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

BORING B-4

LOCATION: Lat: 30.2805°, Long: -97.7496°

Elevation: 493.00

DEPTH, FT.	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
	3 inches Asphalt, 5 inches Base											
	FAT CLAY with SAND (CH), stiff to hard, brown	17			8							
		19	4	89	9			57	17	40		
5		17			13							
		20	1	96				64	21	43		
10		20			25							
15		15			31							
20		17	1	94	41			67	22	45		
25		17			50							
30	SHALE, hard, gray	17			55							



COMPLETION DEPTH: 70.0 Feet
DATE: 2/24/25-2/24/25

DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered
DELAYED WATER LEVEL (FT): N/A

Shoal Creek Condos

1501 Shoal Creek Boulevard, Austin, Texas

Project No. 03031973

BORING B-4

LOCATION: Lat: 30.2805°, Long: -97.7496°

DEPTH, FT.	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
	SHALE, hard, gray	13			50/4"							
35	SHALE, gray					100	78					
	- continuous recovery and good quality from 35 ft to 40 ft											
40						100	93				>>202	137
45	- continuous recovery and excellent quality from 40 ft to 50 ft					100	100					
50	- continuous recovery and fair quality from 50 ft to 55 ft					100	73				>>390	158
55						100	85					
	- continuous recovery and good quality from 55 ft to 60 ft											
60												

HAND PEN (TSF) / UNC CMP (TSF): 2.0, 4.0, 6.0

PL, WC, LL: 20, 40, 60

COMPLETION DEPTH: 70.0 Feet

DATE: 2/24/25-2/24/25

DEPTH TO GROUND WATER

SEEPAGE (ft.): Not Encountered

END OF DRILLING (ft.): Not Encountered

Shoal Creek Condos
1501 Shoal Creek Boulevard, Austin, Texas
Project No. 03031973

BORING B-4

LOCATION: Lat: 30.2805°, Long: -97.7496°

DEPTH, FT.	SYMBOL	SAMPLES	WATER	SOIL DESCRIPTION	MOISTURE CONTENT	% RETAINED #4	% PASSING #200	SPT (N) & TCP (T) VALUES	% REC	%RQD	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	○ HAND PEN (TSF) ● UNC CMP (TSF) 2.0 4.0 6.0 / PL WC LL 20 40 60	UNCONF. COMP. (TSF)	UNIT DRY WT. (LB/CU FT)
				SHALE, gray												
				- continuous recovery and excellent quality from 60 ft to 65 ft					100	100						
65																
									98	87						
				- continuous recovery and good quality from 65 ft to 70 ft												
70				- Boring terminated at approximately 70 ft												
75																
80																
85																
90																

COMPLETION DEPTH: 70.0 Feet
DATE: 2/24/25-2/24/25

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DEPTH TO GROUND WATER
SEEPAGE (ft.): Not Encountered
END OF DRILLING (ft.): Not Encountered

KEY TO TERMS AND SYMBOLS USED ON LOGS

ROCK CLASSIFICATION

RECOVERY

DESCRIPTION OF RECOVERY	% CORE RECOVERY
Incompetent	< 40
Competent	40 TO 70
Fairly Continuous	70 TO 90
Continuous	90 TO 100

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION OF ROCK QUALITY	RQD
Very Poor (VPo)	0 TO 25
Poor (Po)	25 TO 50
Fair (F)	50 TO 75
Good (Gd)	75 TO 90
Excellent (ExInt)	90 TO 100

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	N-VALUE (Blows/Foot)	SHEAR STRENGTH (tsf)	HAND PEN VALUE (tsf)
Very Soft	0 TO 2	0 TO 0.125	0 TO 0.25
Soft	2 TO 4	0.125 TO 0.25	0.25 TO 0.5
Firm	4 TO 8	0.25 TO 0.5	0.5 TO 1.0
Stiff	8 TO 15	0.5 TO 1.0	1.0 TO 2.0
Very Stiff	15 TO 30	1.0 TO 2.0	2.0 TO 4.0
Hard	>30	>2.0 OR 2.0+	>4.0 OR 4.0+

SOIL DENSITY OR CONSISTENCY

DENSITY (GRANULAR)	CONSISTENCY (COHESIVE)	THD (BLOWS/FT)	FIELD IDENTIFICATION
Very Loose (VLo)	Very Soft (VSo)	0 TO 8	Core (height twice diameter) sags under own weight
Loose (Lo)	Soft (So)	8 TO 20	Core can be pinched or imprinted easily with finger
Slightly Compact (SICmpt)	Stiff (St)	20 TO 40	Core can be imprinted with considerable pressure
Compact (Cmpt)	Very Stiff (VSt)	40 TO 80	Core can only be imprinted slightly with fingers
Dense (De)	Hard (H)	80 TO 5"/100	Core cannot be imprinted with fingers but can be penetrated with pencil
Very Dense (VDe)	Very Hard (VH)	5"/100 to 0"/100	Core cannot be penetrated with pencil

DEGREE OF PLASTICITY OF COHESIVE SOILS

DEGREE OF PLASTICITY	PLASTICITY INDEX (PI)	SWELL POTENTIAL
None or Slight	0 to 4	None
Low	4 to 20	Low
Medium	20 to 30	Medium
High	30 to 40	High
Very High	>40	Very High

BEDROCK HARDNESS

MORHS' SCALE	CHARACTERISTICS	EXAMPLES	APPROXIMATE THD PEN TEST	
5.5 to 10	Rock will scratch knife	Sandstone, Chert, Schist, Granite, Gneiss, some Limestone	Very Hard (VH)	0" to 2"/100
3 to 5.5	Rock can be scratched with knife blade	Siltstone, Shale, Iron Deposits, most Limestone	Hard (H)	1" to 5"/100
1 to 3	Rock can be scratched with fingernail	Gypsum, Calcite, Evaporites, Chalk, some Shale	Soft (So)	4" to 6"/100

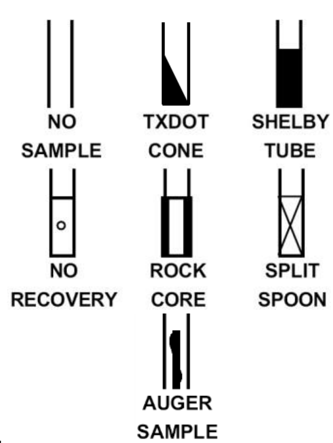
MOISTURE CONDITION OF COHESIVE SOILS

DESCRIPTION	CONDITION
Absence of moisture, dusty, dry to touch	DRY
Damp but no visible water	MOIST
Visible free water	WET

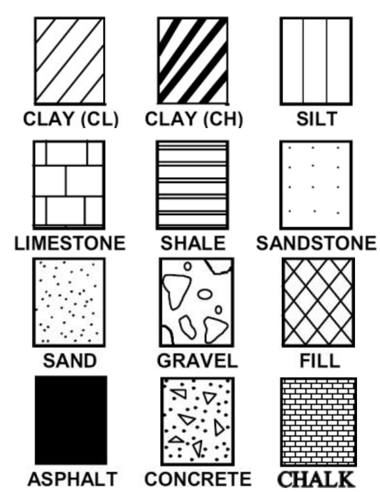
RELATIVE DENSITY FOR GRANULAR SOILS

APPARENT DESNITY	SPT (BLOWS/FT)	CALIFORNIA SAMPLER (BLOWS/FT)	MODIFIED CA. SMAPLER (BLOWS/FT)	RELATIVE DENSITY (%)
Very Loose	0 to 4	0 to 5	0 to 4	0 to 15
Loose	4 to 10	5 to 15	5 to 12	15 to 35
Medium Dense	10 to 30	15 to 40	12 to 35	35 to 65
Dense	30 to 50	40 to 70	35 to 60	65 to 85
Very Dense	>50	>70	>60	85 to 100

SAMPLER TYPES



SOIL TYPES



ABBREVIATIONS

PL – Plastic Limit
LL – Liquid Limit
WC – Percent Moisture

Q_P – Hand Penetrometer
Q_U – Unconfined Compression Test
UU – Unconsolidated Undrained Triaxial

Note: Plot Indicates Shear Strength as Obtained By Above Tests

WATER SEEPAGE

WATER LEVEL AT END OF DRILLING

CLASSIFICATION OF GRANULAR SOILS

U.S. STANDARD SIEVE SIZE(S)

6" 3" 3/4" 4 10 40 200

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		

152 76.2 19.1 4.76 2.0 0.42 0.074 0.002

A COMPLETE BUILDING SOLUTION

Everything you need from start to finish – Assurance, Testing, Inspection, and Certification

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Environmental Consulting & Geotechnical Services

Assuring site and subsurface conditions meet the criteria for purchase, development and construction.

Building Systems Consulting

Industry professionals provide a variety of acoustic, fire, AV, roofing system and enclosure consulting services to ensure proper design and installation of a building's critical systems.

Decommissioning & Due Diligence

Supporting the redevelopment and transfer of property assets via environmental and property assessments and engineering services.

Building Product & Construction Materials Testing

Providing testing for virtually all types of building products, construction materials, and systems for safety, retail, code, and performance purposes.

Property Management Support Services

Providing a variety of building systems testing, inspection, and consulting services to optimize the value and life of the property asset.

Product Certification & Code Evaluation

The ETL and Warnock Hersey Marks show a product or system's conformance to code and ensures the on-going verification of compliance.

Mock-Up & Field Testing

On-site (air infiltration, water leakage, and structural performance for fenestration) or in lab validation of a curtain wall's design, workmanship, and material selection to ensure its performance.

Field Labeling

Providing on-site services of opening systems that need to be re-labeled or making recommendations for upgraded materials.

Building Enclosure Commissioning

Design and construction professionals provide solutions to reduce the potential for premature building failure, increase a building's energy efficiency, and expected life cycle.

Industrial Hygiene Services

Assessing a building or facility for a variety of sources (air, asbestos, lead, mold) to minimize the risk of factors adverse to human health.

BCFSNA030-2P

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The ever increasing challenges of designing, constructing, and maintaining a building can be difficult for any organization to navigate. From compliance to local and national codes, to ensuring an efficient design, to property management, Intertek-PSI's team of architects, engineers, scientists, and technicians understand firsthand the complexities of successfully constructing a commercial building. Our full suite of services give us unique insight into all phases of a project. Regardless of the project size or complexity, Intertek-PSI delivers engineering, consulting, and testing services to support site selection, design, construction, and property management.

As a leader in providing comprehensive solutions to industries around the globe, Intertek-PSI prides itself on bringing the expertise and services necessary for our clients to meet all of their needs across their entire operation. **Our Assurance, Testing, Inspection, and Certification (A.T.I.C.)** suite of services ensures that whatever your needs may be – assurance, testing, inspection, certification, or all of the above, that those needs will be met by Intertek-PSI.

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Our expertise offers engineering, consulting, evaluation, and peer review to ensure a well designed project.

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Vital services throughout the construction process including inspection, testing, monitoring, mock-ups, and consulting.

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