GEOTECHNICAL ENGINEERING REPORT

LEE'S SUMMIT LOGISTICS BUILDING NO. 3

Prepared for:
Scannell Properties
Indianapolis, Indiana

April, 2022
Olsson Project No. C21-04157

olsson®

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April 18, 2022

Scannell Properties
Attn: Mr. Shaun Cofer
8801 River Crossing Boulevard, Suite 300
Indianapolis, Indiana 46240

Re: Geotechnical Engineering Report
Lee’s Summit Logistics Center Building No. 3
Lee’s Summit, Missouri
Olsson Project No. C21-04157

Dear Mr. Cofer,

Olsson has completed the geotechnical engineering report for the new warehouse structure and associated pavements. The enclosed report summarizes our understanding of the project, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and based on those conditions, provides geotechnical engineering recommendations for the new warehouse and pavements.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience.

Respectfully submitted,
Olsson, Inc.

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4/18/22

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1. PROJECT INFORMATION

1.1 Geotechnical Scope

This Geotechnical Engineering Report presents the results of the subsurface explorations for Building No.3 for the Lee's Summit Logistics Center in Lee's Summit, Missouri. We drilled seven borings for the proposed building and associated pavement areas. The approximate locations of the borings are presented on the Boring Location Map in Appendix A and the associated Borehole Reports are presented in Appendix B. Laboratory test results are presented in Appendix C. The purpose of this report is to analyze the subsurface conditions encountered at the borings, and based on those conditions, provide geotechnical engineering recommendations for the preparation of the site, foundation recommendations, support of the floor slabs and pavements, and minimum pavement thicknesses for the associated pavements.

Olsson, Inc. (***Olsson***) previously submitted a Preliminary Geotechnical Engineering Report (***Olsson*** project number 021-04157, dated June 22, 2021) providing preliminary geotechnical recommendations for the site. As part of the preliminary report, four of the subsurface exploratory borings (B-3 through B-6) are located within or near the work planned as part of this phase. We have appended these respective borehole reports in Appendix D.

1.2 Project Site

The project site is located south of NW Victoria Drive and northeast of NW Main Street in Lee's Summit , Missouri (Figure 1). At the time of our exploration, the surface conditions within the proposed building pad and associate pavements consisted of shallow rooted grass pastures with heavy tree and brush undergrowth to the south. The site generally slopes down from the northeast to the southwest with elevations ranging from 955 feet to 987 feet. Based on readily available images provided by Google Earth, a pond is located within the treed area in the southwest (Figure 2).

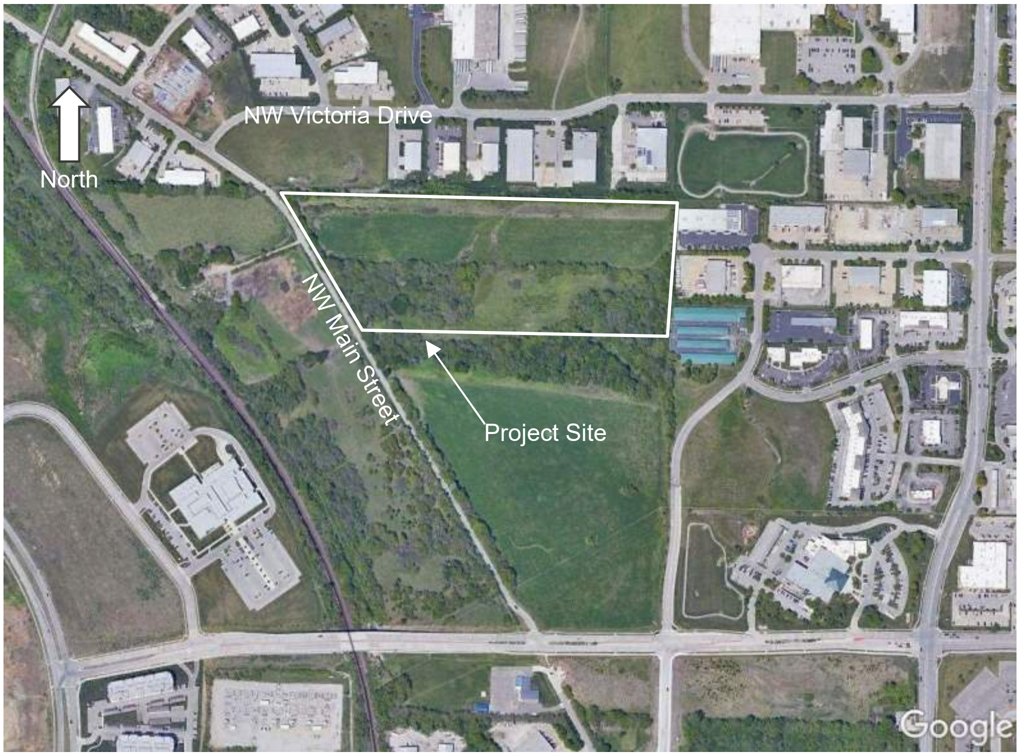


Figure 1. Project Site Location

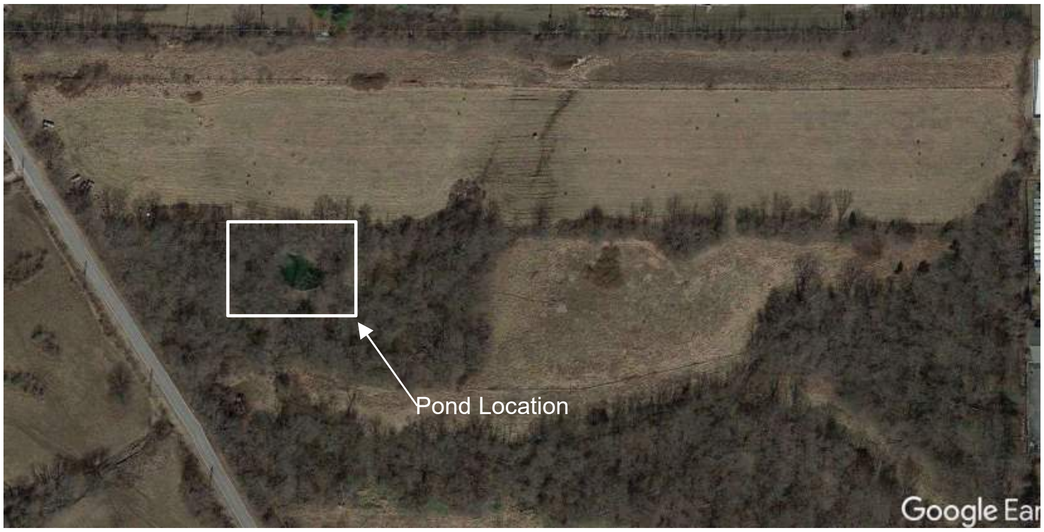


Figure 2. Project Site circa 2020

1.3 Project Information

We understand that Building No. 3 will consist of a warehouse structure with an approximate footprint area of 238,140 square feet. The slab-on-grade, dock high structure will utilize precast tilt up panel walls. Based on our experience with similar sized projects, we anticipate that the warehouse will have column loads of less than 150 kips and wall loads less than 8 kips per linear foot (klf). The finished floor elevation of the warehouse is expected to be 973.25 feet. Loading docks, truck parking and truck dive paths are planned on the southeast perimeter of the warehouse. Personal vehicle parking and drive paths are planned for the north, east and west edges of the proposed warehouse. Entrance drives to the truck and personal parking areas are planned to be located to the south and east of the structure.

Based on the provided grading plan, we anticipate up to 8 feet of cut and 14 feet of fill will be required within the building pad. In addition, several reinforced modular block retaining walls are planned to provide grade separation.

Two detention basins are planned to the west and east of the structure. The basins will have a depth of 7 feet and 8 feet, respectively.

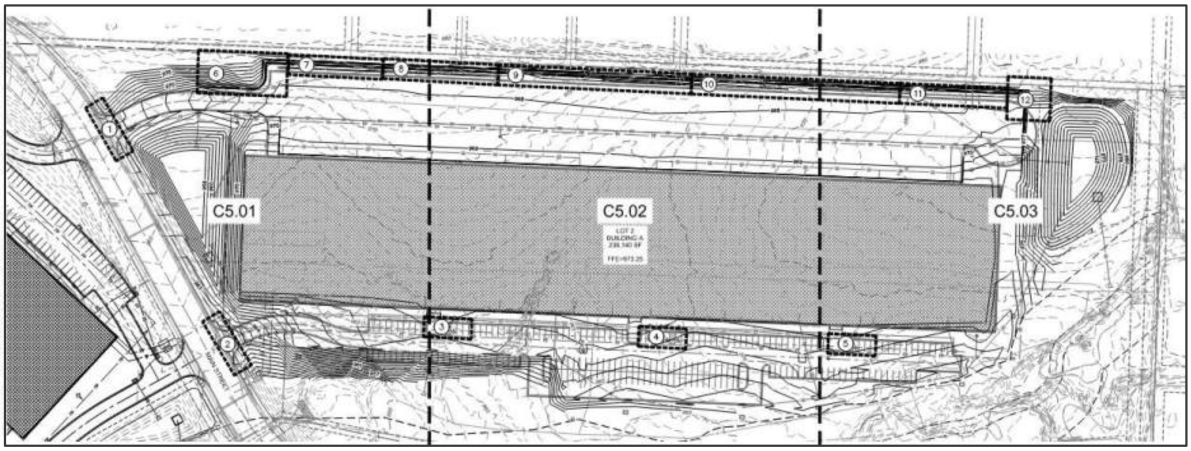


Figure 3. Proposed Site Layout

2. FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

The drill crew used an all-terrain vehicle mounted CME-550 drill rig, equipped with continuous flight augers to advance the seven borings at the site. The depths of the borings ranged from approximately 8 feet to 15 feet below the existing surface. The boring locations were staked in the field and elevations were determined by an ***Olsson*** survey crew. Surface elevations of the borings are shown on the appended Borehole Reports. These elevations have been rounded to nearest tenth of a foot.

We obtained soil samples with thin-walled sampling tubes hydraulically pushed into the soil and split-barreled sampling tubes during the performance of the Standard Penetration Test (SPT). Sampling depths and SPT blow counts (N-values) are shown on the appended Borehole Reports in Appendix B. Water level observations were made in the borings at the times and conditions noted on the Borehole Reports.

The drill crew prepared a field log for each boring. These field logs include visual classifications of the materials encountered during the drilling process as well as the drillers’ interpretation of the subsurface conditions between the samples. The appended Borehole Reports represent the engineer’s interpretation of the field logs and includes modifications based on the laboratory observations and test results.

2.2 Laboratory Testing

At our laboratory, we classified the soil samples in general accordance with the Unified Soil Classification System (USCS). We measured the moisture content of each sample. Dry density and unconfined compressive strength tests were performed on selected tube samples. We measured the Atterberg Limits of a selected sample. Results of the laboratory tests are shown on the appended Borehole Reports and in Appendix C.

3. SUBSURFACE CONDITIONS

3.1 Area Geology

According to the United States Department of Agriculture, the project site lies within the Greenton silty clay loam, Arisburg-Urban land, and Greenton-Urban land complexes in Jackson County, Missouri. The primary soil type consists of silty clay loam derived from windblown sediment (loess), over residuum from limestone and shale bedrock. According to the Missouri Department of Natural Resources, the site's bedrock profile belongs to the Linn Subgroup of the Kansas City Group. The late Pennsylvanian-Missouri aged bedrock consists of alternating layers of limestone and shale with the occasional sandstone seam. Figure 4 presents a generalized section of the bedrock at the site.

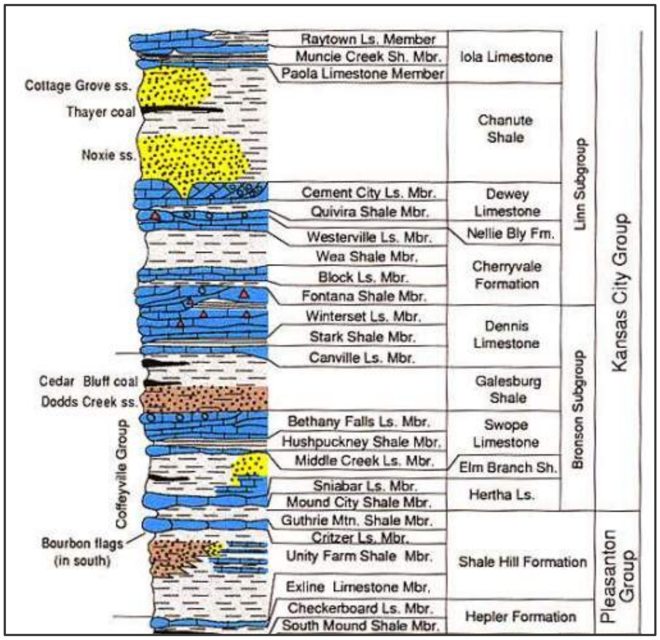


Figure 4. Generalized Linn Subgroup Bedrock Formation

3.2 Subsurface Stratifications

The subsurface conditions shown on the borehole reports represent conditions at the specific boring locations at the times they were drilled. Variations may occur between and beyond the borings. The stratification lines shown on the appended Borehole Reports represent the approximate locations of changes in soil and bedrock types. The actual transitions between materials is usually gradual. Based on the borings and laboratory test results, the subsurface conditions at this project site can be generalized as follows.

Below the rootzone layer, we encountered native lean-to-fat clay soils extending to approximate depths of 8 feet to 14.5 feet. The native clays were generally stiff to very stiff, dark brown to brown and gray transitioning to reddish brown, brownish gray and olive brown. The native soils were generally moist and contained variable amounts of silt. As the clay soils increased in depth, they became shaley. Borings B-2C through B-4C and B-7C terminated in the native clay soils at a depth of 10 feet.

At the remaining borings, gray, limestone bedrock was encountered below the clay soils. The carbide tipped drill bit was able to advance approximately 3 to 6 inches into the limestone bedrock before encountering practical auger refusal. Refusal depths ranged from 12.5 feet (B-1C), 14.8 feet (B-5C) and 8.1 feet (B-6C).

3.3 Water Level Observations

Each boring was monitored for groundwater during and immediately after the completion of drilling operations. Groundwater was not encountered in either instance during our subsurface exploration. The lack of groundwater should not be construed to represent a permanent or stable condition. Variations and uncertainties exist with relatively short-term water level observations in boreholes. Water levels can and should be anticipated to vary between boring locations, as well as time within specific borings. Water can and typically collects near the interface between different materials, such as soil and bedrock. Groundwater levels can fluctuate with variations in precipitation, site grading, drainage, and adjacent land use. Long term monitoring with piezometers generally provides a more representative reflection of the potential range of groundwater conditions.

4. GEOTECHNICAL CONSIDERATIONS

Our previous experience with former agricultural sites, has shown that is common practice to push miscellaneous debris/trash directly into old excavations or washouts around the farm or into drainage areas to help control erosion. Fill materials were not encountered during our subsurface exploration, but the earthwork contractor should be aware that these materials may be encountered during grading operations. We recommend that a representative of ***Olsson*** be on-site to monitor the earthwork and excavation operations and to document the presence of suspicious fill, buried debris, or otherwise unsuitable material that may be encountered across the project site. If encountered, these unsuitable materials should be removed and replaced with structural fill.

As previously mentioned, an agricultural pond is currently located within the proposed south parking lot and the southwest quarter of the proposed building pad. Soils located within the area and surrounding the pond have an inherent risk to be soft in consistency, low in density and wet in moisture content levels. Additionally, laboratory tests indicate that the upper 3 feet of the on-site clay soils exhibit a relatively lower density and a higher moisture content. Depending on the time of year that construction begins, the subgrade soils may likely require significant moisture conditioning in order to provide a stable subgrade. Drying can be accomplished by discing a minimum of 9 inches of material, allowing the material to air-dry, and recompacting the material to the specifications provided in this report. Supplemental drying techniques, including the use of Class "C" fly ash may be required to adequately dry the soil.

We encountered limestone bedrock at an elevation generally below 965 feet. We anticipate rock removal techniques will be required towards the east of the site and may be required in other areas. In relatively tight excavations and below auger refusal depths, bedrock may be difficult to excavate and may require the use of pneumatic breakers or other hard rock removal techniques.

Based on the borings, it is possible that foundations located in the northeastern area of the building pad could encounter limestone bedrock during construction. Structures bearing on a combination on a combination of soil and bedrock, carries inherent risk of differential settlements with greater settlements occurring where the footings bear on the site's cohesive soils. In our opinion the proposed the structure could bear on a combination of clay soils and limestone bedrock if the project owner can accept the risks of a structure bearing on a combination of subgrade materials.

As previously mentioned, up to 14 feet of fill will be placed within thin the proposed building pad area, with the greatest amount of fill being placed within the southwest corner of the pad. In the areas where new fill placement exceeds 10 feet, settlement of the existing soils and newly placed fill will occur. While we anticipate most of this settlement will occur during placement of the controlled fill, construction of settlement sensitive utilities, such as utility lines and foundations for the new structure should be delayed until the settlement is substantially complete. We anticipate a minimum delay period of 30 days following completion of fill placement however settlement monitoring plates should be used to determine when settlement is complete. To help limit the settlement, fill placed 10 feet or more below the structure should be compacted to 98 percent of the material's standard Proctor maximum dry density (ASTM D-698).

5. SITE PREPARTION

5.1 General Site Preparation

Site preparation should commence with stripping of any organic, loose, soft, frozen or otherwise unsuitable materials from the entire construction area. These materials should be carefully separated to avoid incorporation of organic materials into new fill sections in the building or pavement areas. Site clearing, grubbing and stripping operations should be performed during dry weather conditions. Operation of heavy equipment on the site during wet conditions could result in excessive rutting and mixing of construction debris with the underlying soils. Any required tree removal should be accomplished at this time as well. Care should be taken to thoroughly remove all root systems, as a zone of desiccated soils may exist in the vicinity of the trees. Materials that are disturbed during tree removal as well as the zone of desiccated soils should be moisture conditioned, undercut and replaced with structural fill outlined in Table 1 of this report. Following site stripping and grubbing, the existing pond should be drained. Any soft soils, wet or unsuitable soils should be over-excavated and replaced with suitable structural fill.

Upon completion of stripping and removal operations, but prior to any new fill being placed on site, we recommend that the exposed ground surface be proofrolled with a loaded tandem axle dump truck weighing at least 20 tons, or similar equipment. Proofrolling operations should be observed by an ***Olsson*** representative. Unstable or unsuitable soils revealed by proofrolling should be removed and replaced with structural fill.

Once proofrolling is complete, the upper 9 inches of exposed subgrade should be scarified, moisture conditioned, and recompacted to a minimum of 95 percent of the material's Standard Proctor maximum dry density (ASTM D-698) at moisture content between optimum and 4 percent above optimum. Once the subgrade has been compacted, the excavated areas should be filled in accordance with recommendations presented in this report.

5.2 Structural Fill

All structural fill and backfill should consist of approved materials, free of organic matter (organic content less than 5 percent), and debris. Also, the soils should not contain particle sizes larger than three inches. Imported fill soils should generally exhibit a liquid limit less than 60 and a plasticity index less than 30. Samples of all proposed fill materials should be submitted to ***Olsson*** for compaction and classification tests. Laboratory Proctor compaction and classification tests should be performed on any fill material placed during mass grading operations. The native on-site soils appear to be suitable for use as structural fill but would not be acceptable for use as Low Volume Change fill placed directly below the slabs.

We recommend that all structural fill and backfill be compacted in accordance with the criteria provided in Table 1. An ***Olsson*** representative should observe fill placement operations and perform field density tests, as required.

Area of Fill Placement	Material	ASTM D-698 Compaction Recommendation	Moisture Content (Percent of Optimum)
Granular Leveling Course – 6" below base of floor slabs	ASTM C-33 No. 57 Aggregate	65% Relative Density	As necessary to obtain density
Low Volume Change – 18" below base of Granular Leveling Course	LL < 50 PI < 25	95%	-1 to +3 percent
	MoDOT Type 5 Baserock*		As necessary to obtain density
Structural Fill – On-site	Recompacted On-Site Soils	95%	0 to +4 percent
Structural Fill – Imported	LL < 60 PI < 30	95%	0 to +4 percent
Structural Fill – Deep Fills Greater than 10 feet	Recompacted On-site soils or Imported Cohesive Soils	98%	0 to +4 percent
Pavement Subgrade – Cohesive Soils	Recompacted On-Site Soils	95%	0 to +4 percent
Pavement Subgrade – Aggregate Base	MoDOT Type 5 Baserock*	95%	As necessary to obtain density
Pavement Subgrade – Chemically Stabilized Cohesive Soils	Fly Ash (15%)/ Lime (5%)/ Cement (5%)**	95%	-1 to +3 percent

*Or equivalent
**Percentages based on dry unit weights

Table 1. Fill Placement Guidelines

Suitable fill materials should be placed in thin loose lifts of 8 inches or less. Within small excavations, such as in utility trenches, around manholes, or behind retaining walls, the use of vibrating plat compactors, jumping jack compactors or walk behind sheepsfoot compactors may be used to facilitate compaction in these areas. Loose lifts thicknesses of 4 inches or less are recommended where small compaction equipment is used.

The moisture content for suitable borrow soils at the time of compaction should generally be maintained between the ranges specified above. More stringent moisture limits may be necessary with certain soils and some adjustments to moistures contents may be necessary to achieve compaction in accordance with project specifications.

5.3 Drainage and Groundwater Considerations

The area surrounding the site should be sloped to promote surface drainage away from the foundation. Water should not be allowed to collect at the ground surfaces near foundations, floor slabs, or areas of new pavement, either during or after construction. Provisions should be made to quickly remove accumulating seepage water or storm water runoff from excavations. Undercut or excavated areas should be sloped toward one corner to allow rainwater or surface runoff to be quickly collected and gravity drained or pumped from construction areas. Subgrade soils that are exposed to precipitation or runoff should be evaluated by ***Olsson*** prior to the placement of new fill, reinforcing steel, or concrete, to determine if corrective action is required.

To minimize concerns related to improper or inadequate drainage away from foundation bearing subgrades or from cohesive backfill materials used in utility or foundation trenches, we recommend the following:

- Site grading should provide for efficient drainage of rainfall or surface runoff away from new structures and pavement.
- Roof run-off should be collected and transferred directly to the storm sewer system or directed to a location with positive and rapid drainage away from new structures and pavements.
- External hose connections in unpaved areas should incorporate splash blocks to prevent accidental flooding of foundation bearing or backfill soils. External hose connections should have cut-off valves inside the building to prevent accidental or unauthorized use.
- Maintenance personnel should be informed of the potential problems associated with watering near the building.

5.4 Detention Basin

Based on our result from the boring located at the base of the northwest detention basin, limestone bedrock will be exposed at the planned elevation of the base. Therefore, we recommend that the bedrock within the detention basin be undercut 12 inches below the base of the basin to allow for the installation of a clay liner.

6. STRUCTURES

6.1 Shallow Foundations

Based on the subsurface conditions observed at the borings, the results from the laboratory tests, and the provided grading plan, we anticipate that he foundations for the new warehouse will bear on a combination of stiff native clay soils and properly compacted cohesive fill soils. For foundations bearing on such materials, a maximum net allowable soil bearing pressure of 2,500 pounds per square foot (psf) can be used for design. The net allowable soil bearing pressure refers to the bearing capacity of the soils at foundation bearing elevations in excess of the surrounding overburden pressure.

For frost protection, all exterior footings should bear at a minimum depth of 3 feet below the finalized adjacent grade. Footings should have a minimum foundation width of 18 inches for continuous footings and 30 inches for isolated column footings. Earth formed trench footings should have a minimum width of 12 inches.

Lightly loaded interior partition walls (applying less than 0.75 kips per lineal foot (klf)) may be supported directly on the slab-on-grade floor. Depending on the floor slab design and the specific wall loads, it may be necessary to increase the floor slab reinforcement or provide a thickened slab cross-section below interior walls. For interior walls with loads greater than 0.75 klf, we recommend a footing be installed, independent of the floor slab, to properly distribute the wall loads to the underlying soils and reduce the potential for floor slab damage.

After foundation subgrades have been observed and evaluated by an ***Olsson*** representative, concrete should be placed as soon as possible to avoid subjecting the exposed soil to drying, wetting, or freezing conditions. If the foundation subgrade soils are subjected to such conditions, ***Olsson*** should be contacted to reevaluate the foundation bearing materials.

As previously mentioned, isolated areas, particularly in the northeast areas of the building footprint, could encounter limestone bedrock during the construction of the footings. In our opinion, support of the proposed buildings on the different materials would be possible if some differential performance of the footings and slabs can be accepted. Provided that abrupt changes in bearing materials over short distances are avoided, it is our opinion that differential settlement should occur gradually across the building area as the transition from footings and slabs supported on bedrock to native soil to fill occurs gradually. Strict moisture and density control of the proposed fill sections will be important to limit potential differential settlement between building elements supported on compacted fill and elements supported on bedrock and native clay soils. Provided the total and differential settlements and the construction delays described in this report are acceptable to the owner, the recommendations presented herein would allow use of a shallow foundation system to support the building. If no risk of differential settlement can be tolerated, the footings for each building will need to bear on similar materials. To accomplish this, footings may need to be extended downward, possibly requiring adjusting the floor elevation or location of the structure on site to minimize the amount of fill placed within the building footprint.

For foundations constructed based on the recommendation provided above, post-construction settlements on the order of 1 inch, for total, and ½-inch for differential settlement between similarly loaded adjacent foundation elements can be expected.

6.2 Floor Slab Subgrade Preparation

For the purposes of this report and based on our experience with similar projects, a uniform load distribution of 500 psf for the floor slab was assumed. If the floor loading is significantly different, ***Olsson*** should be contacted to reevaluate the applicability of the recommendations contained herein.

Based on the provided grading plan, we understand that the floor slabs will bear on on-site and/or imported cohesive soils. Based on results from the borings and laboratory tests, and our experience, these cohesive soils have a moderate risk to shrink and swell with varying moisture contents. In order to mitigate this risk, we recommend a 24-inch thick Low Volume Change (LVC) Zone be installed below each floor slab.

The upper 6 inches of the LVC zone should consist of a well graded, free draining granular (i.e. ASTM C-33 No. 57 aggregate) leveling course. The granular leveling course should be placed directly below the floor slabs. If moisture vapor transmission through the concrete slab is a concern (e.g. if moisture sensitive floor coverings are to be used) a vapor barrier should be used. Underlying the leveling course, 18 inches of additional LVC material should be placed. Acceptable LVC materials consist of cohesive soils exhibiting a liquid limit less than 50 and a plasticity index less than 25, or a well graded granular material having at least 15 percent fines passing through the No. 200 sieve, such as MoDOT Type 5 baserock. The LVC zone materials should be compacted and moisture conditioned to the levels outlined in Table 1 of this report.

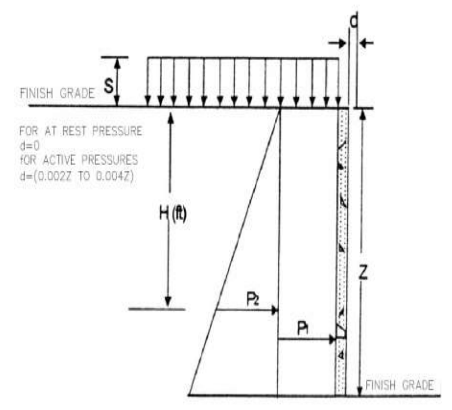
Upon completion of grading operations in the building area, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the floor slab. If the subgrade should become saturated, desiccated, frozen, disturbed, or altered by construction activity, the subgrade should be restored to the conditions recommended in Table 1 of this report.

The procedures recommended above may not eliminate all future subgrade volume change and resultant floor slab movement. However, the procedures outlined should significantly reduce the potential for future subgrade volume change. Common construction practice is to tie the slab-on-grade into the foundation elements to limit the impact of differential movement at doorways and windows. Depending on the location of construction joints in the slab, the rigidity of the slab and foundation connection, and the magnitude of actual movement that occurs, some minor cracking within the floor slab could occur and should be expected.

6.3 Lateral Earth Pressures

The following soil parameters are provided for use in designing below grade cast-in-place concrete retaining walls, such as loading dock walls, subject to lateral earth pressures. The parameters are based on the understanding that the retained soils used during construction will be similar in composition to the on-site soils encountered during this exploration. To ensure similarity, we recommend confirmation testing be performed during construction by ***Olsson***.

The "at-rest" condition assumes no wall rotation and would be applicable for loading dock walls. Walls that are unrestrained at the top and are free to rotate slightly, such as Cast-in-Place concrete cantilever walls, may be designed for "active" earth pressure conditions. The "passive" earth pressure condition should be used to evaluate the resistance of soil to lateral loads. Table 2 presents recommended values of earth pressure coefficients based on our experience with soils in the area. Equivalent fluid densities are frequently used for the calculation of lateral earth pressures for the "at-rest" and "active" conditions and are therefore provided in Table 2.

Legend of Symbols		
Z	Wall Height (ft)	
H	Depth Below Surface (ft)	
D	Wall Displacement (ft)	
S	Surcharge Load (psf)	
P_1	Surcharge Pressure (psf)	
P_2	Earth Load (psf)	
K	Earth Pressure Coefficient	
G	Equivalent Fluid Density (pcf)	
Pressure Coefficients		
Surcharge Pressure	P_1 (psf) = K * S (psf)	
Earth Load	P_2 (psf) = G (pcf) * H (ft)	

Earth Pressure Coefficient (K)			**Equivalent Fluid Density (G)**	
			Drained, pcf	**Undrained, pcf**
Active (K_a)	Cohesive	0.41	50	85
	Granular*	0.31	35	-
At-Rest (K_o)	Cohesive	0.58	70	95
	Granular*	0.47	55	-
Passive (K_p)	Cohesive	2.46	295	205
	Granular*	3.25	390	-

*Granular backfill should be permanently drained

Table 2. Lateral Earth Pressure Parameters

The following assumptions were made:

- For active earth pressure, the wall must rotate about its' base, with top lateral movements of 0.002*Z to 0.004*Z, where "Z" is the wall height.
- The equivalent fluid densities in Table 2 do not include the effects of surcharge loading.
- The equivalent fluid densities in Table assume a level backslope. If a backslope is included, ***Olsson*** should be contacted to update the earth pressure coefficient and associated equivalent fluid density.
- The wall must move horizontally to mobilize passive resistance.
- Surcharges are uniform, where "S" is surcharge pressure, in psf.
- In-situ backfill has a maximum weight of 120 pcf.
- Horizontal backfill is compacted to 95% of standard Proctor maximum dry density.
- Heavy equipment and other concentrated load components are not included.
- No hydrostatic pressure acting on wall. Assumes a drained condition.
- No safety factor is included.
- Passive pressure in the frost zone or moisture fluctuation zone should be ignored.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, an ultimate coefficient of friction value of 0.30 should be used where the footing bears on soil and 0.65 where the footing bears on limestone bedrock.

To intercept infiltrating surface water behind the wall, we recommend a perimeter drain be installed at the foundation level and/or weep holes be placed at regular intervals along the wall. The drain line invert should be below the finished subgrade elevation for the interior floor. The drain line should be sloped to provide positive gravity drainage and should be surrounded by free-draining granular material graded to prevent the intrusion of fines, or an alternative free-draining granular material encapsulated with suitable filter fabric. A minimum 1-foot-wide section of free-draining granular fill should be used for backfilling above the drain line and adjacent to the wall and should extend to within 2 feet of final grade. The granular backfill should be capped with compacted cohesive fill to minimize infiltration of surface water into the drain system.

6.4 Modular Block Retaining Walls

We understand that Mechanically Stabilized Earth (MSE) Walls or large gravity modular blocks may be used to provide grade separation at this site. Our experience and that of our profession indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services during design and construction. Therefore, we recommend Olsson be contracted to design and observe the construction of these walls once details are made available.

Regardless of the design firm, we recommend the following general and specific considerations be included in the project specifications for the wall design: Walls should be designed to provide adequate structural and functional performance for a service life of at least 75 years. Internal stability analyses should conform to the latest design methodology accepted for use by the Federal Highway Administration (FHWA), AASHTO or the National Concrete Masonry Association (NCMA). The analysis should be based on the use of drained strength parameters, requiring the backfill used in the geogrid reinforced backfill section to be a drainable, granular material. Cohesive soil or granular material containing high amounts of fines (typically greater than 15 percent) are not considered drainable and should not be allowed in the geogrid reinforced backfill zone. The designer should state the backfill material description and design strength parameters in the construction specifications so that unsuitable materials are not allowed in the backfill zone during construction.

Global stability of the wall system should be analyzed using both drained and undrained strength parameters. The wall contractor/designer should be required to provide the global stability analyses based on the planned final cross section, including the topography above and below the wall, using the generalized subsurface stratigraphy discussed in this report.

6.5 Site Seismic Classification

For this project site, the soil conditions encountered are consistent with the definition of Site Class “C” (Very Dense Soil and Soft Rock profile) as defined in ASCE 07-16.

7. PAVEMENTS

7.1 Pavement Subgrade Preparation

We understand that personal vehicle parking and drive paths will be located to the south proposed structure. Loading dock parking areas are planned to the north of the warehouse. Two entrance drives to the loading dock areas are planned for the site. One is located at the northwest corner of the proposed structure, feeding from the newly routed NW Main Street. The second loading dock entrance is located at the east perimeter of the structure, feeding from the personal vehicle parking lot.

The new pavements for the warehouse structure should be supported on 8 to 12 inches (See Table 3) of properly placed and compacted well-graded granular material such as MoDOT Type 5 baserock (or equivalent) over 9 inches of recompacted on-site cohesive soil. The on-site cohesive soil should be compacted to 95 percent of the material's Standard Proctor maximum dry density (ASTM D-698) and moisture conditioned between optimum and 4 percent above optimum.

We recommend that the prepared subgrade extend a minimum of 2-feet outside the pavements, where feasible. ***Olsson*** should be present during subgrade preparation to observe, document, and test compaction of the materials at the time of placement. As recommended for all prepared soil subgrades, heavy, repetitive construction traffic should be controlled, especially during periods of wet weather, to minimize disturbance. The final prepared subgrade should be proof rolled with a loaded dump truck or similar rubber-tired equipment with a total weight of at least 20-tons, immediately prior to placement of new pavements. Proofrolling operations should be observed and documented by ***Olsson***. Unstable or unsuitable soils revealed by proofrolling should be reworked to provide a stable subgrade or removed and replaced with structural fill.

Construction scheduling often involves grading and paving by separate contractors and can involve a time lapse between the end of grading operations and the commencement of paving operations. Disturbance, desiccation, or wetting of the subgrade soils between grading and paving operations can result in the deterioration of the previously completed subgrade. If soft and/or wet areas are identified during subgrade preparation or if the subgrade soils have been exposed to adverse weather conditions, frost, excessive construction traffic, standing water, or similar conditions, ***Olsson*** should be consulted to determine if corrective action is necessary.

It is important that the pavement subgrade support be relatively uniform, with no abrupt changes in the degree of support. Non-uniform pavement support can occur as a result of varying soil moisture contents or soil types, or where improperly placed utility backfill has been placed across or through areas to be paved. Improper subgrade preparation such as inadequate vegetation removal, failure to identify soft or unstable areas by proofrolling, and inadequate or improper compaction can also produce non-uniform subgrade support.

7.2 Pavement Section Thicknesses

Table 3 summarizes typical pavement section for the Warehouse Pavements. The sections represent typical minimum thicknesses. Routine maintenance of the pavement will be required, consisting of periodic seal coats and possible one intermediate mill, in addition to regular crack maintenance.

	AC w/ Granular Base*	**Full Depth PCC***
Personal Vehicle Traffic	2" AC Surface 4" AC Base 8" Compacted MoDOT Type 5 Baserock**	6" PCC 4" Clean Rock Base
60 Trucks per Day	2" AC Surface 5" AC Base 12" Compacted MoDOT Type 5 Baserock**	8" PCC 4" Clean Rock Base
300 Trucks per Day	2" AC Surface 7" AC Base 12" Compacted MoDOT Type 5 Baserock	9" PCC 4" Clean Rock Base

*Supported on 9" of recompacted on-site cohesive soil
**Or equivalent

Table 3. Minimum Pavement Sections

PCC pavements are recommended for trash receptacle pads, loading dock areas and where heavy wheel loads will be concentrated within Building 3. Concrete pavements in these areas should have a minimum thickness as defined in Table 3. It is also recommended that a 4-inch leveling, and drainage course of clean, crushed rock be placed below all PCC pavements. The clean rock base for PCC pavements should be uniform and pavement subgrade should be graded to provide positive drainage of the granular base section. The granular section should be graded to adjacent storm sewer inlets and provisions should be made to provide drainage from the granular section into the storm sewers. Drainage of the granular base is particular important where two different sections of pavements (such as AC and PCC) abut, so that water does not pond beneath the pavements and saturate the subgrade soils. We further recommend that the length of concrete sections be such that no heavy truck wheels are allowed to rest on asphaltic concrete sections during loading/unloading operations.

The performance of the pavements will be dependent upon a number of factors, including subgrade conditions at the time of paving, rainwater runoff, and traffic. Rainwater runoff should not be allowed to seep below pavements from adjacent areas. Pavements should be sloped approximately ¼ inch per foot to provide for rapid surface drainage.

Proper drainage below the pavement section helps prevent softening of the subgrade and has a significant impact on pavement performance and pavement life. Therefore, we recommend that a granular blanket drain be constructed at all storm sewer inlets within the pavement areas. The blanket drain should consist of clean, crushed rock extending a minimum of 6 inches below pavement subgrade level. The blanket drains should extend radially a minimum of 8 feet from each of the storm sewer inlets. The grade within the blanket drain should be sloped toward the storm sewer inlet, and weep holes should be drilled through the inlet to provide drainage of the granular section into the inlet. Placement of a geotextile filter fabric across the weepholes could be considered to prevent loss of aggregate through the weep holes.

Construction traffic on the pavements has not been considered in the above noted typical sections. If construction scheduling dictates that the pavements will be subjected to traffic by construction equipment, increasing the pavement thickness should be considered to include the effects of additional traffic loading. Construction traffic should not be allowed on partially completed pavements as the pavements will not have adequate structural capacity and could be damaged.

8. CONCULSIONS AND LIMITATIONS

8.1 Construction Observation and Testing

We recommend that all earthwork during construction be monitored by a representative of ***Olsson***, including site preparation, placement of all structural fill and trench backfill, and pavement subgrades. The purpose of these services would be to provide ***Olsson*** the opportunity to observe the soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

8.2 Limitations

The conclusions and recommendations presented in this report are based on the information available regarding the proposed construction, the results obtained from our borings, laboratory testing program, and our experience with similar projects. The borings represent a very small statistical sampling of subsurface soils and it is possible that conditions may be encountered during construction that are substantially different from those indicated by the borings. In these instances, adjustments to design and construction may be necessary.

This geotechnical report is based on the site plan and our understanding of the project's information as provided to ***Olsson***. Changes in the location or design of new structures could significantly affect the conclusions and recommendations presented in this geotechnical report. ***Olsson*** should be contacted in the event of such changes to determine if the recommendations of this report remain appropriate for the revised site design.

This report was prepared under the direction and supervision of a Professional Engineer registered in the State of Missouri with the firm of **Olsson, Inc**. The conclusions and recommendations contained herein are based on generally accepted, professional, geotechnical engineering practices at the time of this report, within this geographic area. No warranty, express or implied, is intended or made. This report has been prepared for the exclusive use of **Scannell Properties** and their authorized representatives for the specific application to the proposed project described herein.

APPENDIX A

Boring Location Map

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Scale: n.t.s.
Project No. C21-04157
Approved by: JDP
Date: 1/5/2022

Boring Location Plan

Scannell Lee's Summit Building C
Lee's Summit, Missouri

APPENDIX B

Borehole Reports Symbols and Nomenclature

SYMBOLS AND NOMENCLATURE

DRILLING NOTES

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon Sample (1.375” ID, 2.0” OD)	HSA:	Hollow Stem Auger	NE:	Not Encountered
U:	Thin-Walled Tube Sample (3.0” OD)	CFA:	Continuous Flight Auger	NP:	Not Performed
CS:	Continuous Sample	HA:	Hand Auger	NA:	Not Applicable
BS:	Bulk Sample	CPT:	Cone Penetration Test	% Rec:	Percent of Recovery
MC:	Modified California Sampler	WB:	Wash Bore	WD:	While Drilling
GB:	Grab Sample	FT:	Fish Tail Bit	IAD:	Immediately After Drilling
SPT:	Standard Penetration Test Blows per 6.0”	RB:	Rock Bit	AD:	After Drilling
		PP:	Pocket Penetrometer	CI:	Cave In

DRILLING PROCEDURES

Soil samples designated as “U” samples on the boring logs were obtained in using Thin-Walled Tube Sampling techniques. Soil samples designated as “SS” samples were obtained during Penetration Test using a Split-Spoon Barrel sampler. The standard penetration resistance ‘N’ value is the number of blows of a 140 pound hammer falling 30 inches to drive the Split-Spoon sampler one foot. Soil samples designated as “MC” were obtained in using Thick-Walled, Ring-Lined, Split-Barrel Drive sampling techniques. Recovered samples were sealed in containers, labeled, and protected for transportation to the laboratory for testing.

WATER LEVEL MEASUREMENTS

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In relatively high permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with only short-term observations.

SOIL PROPERTIES & DESCRIPTIONS

Descriptions of the soils encountered in the soil test borings were prepared using Visual-Manual Procedures for Descriptions and Identification of Soils.

PARTICLE SIZE

Boulders	12 in. +	Coarse Sand	4.75mm-2.0mm	Silt	0.075mm-0.005mm
Cobbles	12 in.-3 in.	Medium Sand	2.0mm-0.425mm	Clay	<0.005mm
Gravel	3 in.-4.75mm	Fine Sand	0.425mm-0.075mm		

COHESIVE SOILS

Consistency	Unconfined Compressive Strength (Qu) (tsf)
Very Soft	<0.25
Soft	0.25 – 0.5
Firm	0.5 – 1.0
Stiff	1.0 – 2.0
Very Stiff	2.0 – 4.0
Hard	> 4.0

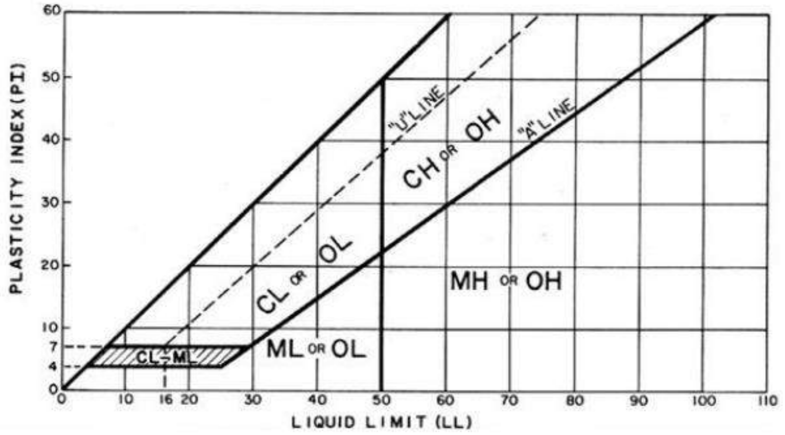
COHESIONLESS SOILS

Relative Density	‘N’ Value
Very Loose	0 – 3
Loose	4 – 9
Medium Dense	10 – 29
Dense	30 – 49
Very Dense	≥ 50

COMPONENT %

Description	Percent (%)
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45
Mostly	50 - 100

PLASTICITY CHART



ROCK QUALITY DESIGNATION (RQD)

Description	RQD (%)
Very Poor	0 – 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 – 100

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G:\Admin\TEAMS\Geotech\AASHTO\Lab Forms\Symbols and Nomenclature gINT.doc

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BOREHOLE REPORT NO. B-1C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	APPROX. SURFACE ELEV. (ft): 973.8		0								
	ROOT ZONE 0.5'										
	FAT CLAY *Stiff, dark brown with brown, silty, moist, trace organics* 2.0'	▨		■ U 1				20.7	85.8		P.P. = 4.5+
970	***LEAN CLAY*** *Stiff, brown with reddish brown, shaley, moist* 7.0'	▨	5	■ U 2				20.2	102.2		P.P. = 3.5
965	***FAT CLAY*** *Stiff, brown with reddish brown and gray, silty, moist* 12.0'	▨	10	■ U 3				26.7	98.3		P.P. = 2.5
	LIMESTONE *Gray* 12.5'										

REFUSAL AT 12.5 FEET

WATER LEVEL OBSERVATIONS	
WD	∇ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	2/1/22	FINISHED:	2/1/22
DRILL CO.: RC DRILLING		DRILL RIG:	CME 550X
DRILLER:	LUKE	LOGGED BY:	ARIANNA
METHOD: CONTINUOUS FLIGHT AUGER			

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BOREHOLE REPORT NO. B-2C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	APPROX. SURFACE ELEV. (ft): 975.7		0								
975	***ROOT ZONE*** ***0.5'***										
	FAT CLAY *Very stiff, brown, silty, moist* ***3.0'***	▨		■ U 1				27.8	91.2		P.P. = 4.5+
	Stiff, brown with reddish brown and gray, silty	▨	5	■ U 2				22.0	93.8		P.P. = 3.5
970	***6.5'***	▨									
	Stiff, brown with reddish brown, silty, moist ***9.0'***	▨		■ U 3			1.7	31.2	93.0		
	Stiff, brown with olive brown and reddish brown, shaley, very moist ***10.0'***	▨	10								

BASE OF BORING AT 10.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED: 1/31/22	FINISHED: 1/31/22
DRILL CO.: RC DRILLING	DRILL RIG: CME 550X
DRILLER: RON	LOGGED BY: ZACH
METHOD: CONTINUOUS FLIGHT AUGER	

BOREHOLE REPORT NO. B-3C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

APPROX. SURFACE ELEV. (ft): 977.8

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ROOT ZONE **0.5'**	⁂	0								
975	***FAT CLAY*** *Stiff, brown with grayish brown and reddish brown, silty, moist* **3.0'**	▨		■ U 1				25.3	92.1		P.P. = 3.5
	Stiff, brown with gray and reddish brown, silty, moist **6.0'**	▨	5	■ U 2				25.0	94.1		P.P. = 4.0
970	*Brown, silty* **8.0'**	▨									
	Stiff, brown with olive brown and gray, shaley, very moist **10.0'**	▨	10	■ U 3			1.3	30.8	93.2		

BASE OF BORING AT 10.0 FEET

WATER LEVEL OBSERVATIONS	
WD	∇ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	1/31/22	FINISHED:	1/31/22
DRILL CO.: RC DRILLING		DRILL RIG:	CME 550X
DRILLER:	RON	LOGGED BY:	ZACH
METHOD: CONTINUOUS FLIGHT AUGER			

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BOREHOLE REPORT NO. B-4C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	APPROX. SURFACE ELEV. (ft): 977.8		0								
	ROOT ZONE ***0.5'***										
	FAT CLAY *Stiff, brown with grayish brown and reddish brown, silty, very moist*	▨		U 1				30.9	90.3		P.P. = 3.3
975	***3.0'***	▨									
	Stiff, reddish brown with gray, sitly, moist	▨	5	U 2				26.6	94.3		P.P. = 2.3
	6.5'	▨									
970	*Stiff, grayish brown and reddish brown, silty, moist*	▨									
	10.0'	▨	10	U 3				27.2	97.0		P.P. = 1.3

BASE OF BORING AT 10.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	1/31/22	FINISHED:	1/31/22
DRILL CO.:	RC DRILLING	DRILL RIG:	CME 550X
DRILLER:	RON	LOGGED BY:	ZACH
METHOD: CONTINUOUS FLIGHT AUGER			

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PROJECT NAME	CLIENT
Lee's Summit Logistics Building No. 3	**Scannell Properties**
PROJECT NUMBER	LOCATION
C21-04157	**Lee's Summit, Missouri**

■ Shelby Tube ☒ Split Spoon

APPROX. SURFACE ELEV. (ft): 980.8

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ROOT ZONE 0.5'		0								
980	***FAT CLAY*** *Stiff, brown with dark brown, silty, moist* 3.0'	▨		■ U 1				27.9	93.0		P.P. = 3.5
	LEAN CLAY *Very stiff, brownish gray with reddish brown and brown, silty, moist* 6.0'	▨	5	■ U 2				23.4	102.2		P.P. = 4.5+
975	***FAT CLAY*** *Very stiff, brownish gray and reddish brown, silty, moist, trace gravel* 11.5'	▨	10	■ U 3	CH		2.2	26.5	98.0	65/49	
970	*Brown with olive brown and reddish brown, silty, shaley* 13.0'	▨									
	Stiff, brown with reddish brown and grayish brown, silty, shaley, moist 14.5'	▨		☒ SS 4		6-9-50/1"		25.3			
	LIMESTONE *Gray* 14.8'										

REFUSAL AT 14.8 FEET

WATER LEVEL OBSERVATIONS	
WD	∇ Not Encountered
IAD	▼ Not Encountered
AD	∇ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	1/31/22	FINISHED:	1/31/22
DRILL CO.:	RC DRILLING	DRILL RIG:	CME 550X
DRILLER:	RON	LOGGED BY:	ZACH
METHOD: CONTINUOUS FLIGHT AUGER			

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BOREHOLE REPORT NO. B-6C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

ELEVATION (ft)	**MATERIAL DESCRIPTION**	**GRAPHIC LOG**	**DEPTH** (ft)	**SAMPLE TYPE NUMBER**	**CLASSIFICATION** (USCS)	**BLOWS/6" N-VALUE**	**UNC. STR.** (tsf)	**MOISTURE** (%)	**DRY DENSITY** (pcf)	**LL/PI** (%)	**ADDITIONAL DATA/ REMARKS**
	APPROX. SURFACE ELEV. (ft): 969.2		0								
	ROOT ZONE ***0.5'***										
	FAT CLAY *Stiff, brown with reddish brown and gray, silty, moist* ***3.0'***	▨		■ U 1			1.8	29.8	91.7		
965	***LEAN CLAY*** *Stiff, brown with reddish brown, silty, moist* ***6.0'***	▨	5	■ U 2				22.6	102.5		P.P. = 4.0
	FAT CLAY *Brown to olive brown and reddish brown, shaley* ***7.9'***	▨									
	LIMESTONE *Gray* ***8.1'***										

REFUSAL AT 8.1 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED: 1/31/22	FINISHED: 1/31/22
DRILL CO.: RC DRILLING	DRILL RIG: CME 550X
DRILLER: RON	LOGGED BY: ZACH
METHOD: CONTINUOUS FLIGHT AUGER	

BOREHOLE REPORT NO. B-7C

Sheet 1 of 1

PROJECT NAME **Lee's Summit Logistics Building No. 3**	CLIENT **Scannell Properties**
PROJECT NUMBER **C21-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube

ELEVATION (ft)	**MATERIAL DESCRIPTION**	**GRAPHIC LOG**	**DEPTH** (ft)	**SAMPLE TYPE NUMBER**	**CLASSIFICATION** (USCS)	**BLOWS/6" N-VALUE**	**UNC. STR.** (tsf)	**MOISTURE** (%)	**DRY DENSITY** (pcf)	**LL/PI** (%)	**ADDITIONAL DATA/ REMARKS**
	APPROX. SURFACE ELEV. (ft): 971.8		0								
	ROOT ZONE ***0.5'***										
970	***FAT CLAY*** *Very stiff, brown with brownish gray, silty, moist* ***3.0'***	▨		■ U 1				25.7	96.0		P.P. = 4.5+
	LEAN CLAY *Very stiff, brown wtih brownish gray, silty, moist* ***6.0'***	▨	5	■ U 2				20.4	105.6		P.P. = 4.5+
965	***FAT CLAY*** *Brown with grayish and reddish brown, silty, moist* ***8.0'***	▨									
	Stiff, reddish brown and dark brown, shaley, moist ***10.0'***	▨	10	■ U 3				28.1	95.9		P.P. = 3.8

BASE OF BORING AT 10.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	1/31/22	FINISHED:	1/31/22
DRILL CO.:	RC DRILLING	DRILL RIG:	CME 550X
DRILLER:	RON	LOGGED BY:	ZACH
METHOD: CONTINUOUS FLIGHT AUGER			

APPENDIX C

Laboratory Test Results

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

PROJECT NAME: Lee's Summit Logistics Building No. 3

PROJECT NUMBER: C21-04157

CLIENT: Scannell Properties

PROJECT LOCATION: Lee's Summit, Missouri

BORING NUMBER	SAMPLE I.D.	SAMPLE DEPTH (ft)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	SATURATION (%)	UNCONFINED STRENGTH (tsf)	STRAIN (%)	ATTERBERG LIMITS			P-200	USCS CLASS.
									LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX		
B-1C	**U-1**	1.0 - 3.0'	20.7	85.8	0.965	57.9							
B-1C	**U-2**	3.0 - 5.0'	20.2	102.2	0.650	83.9							
B-1C	**U-3**	8.0 - 10.0'	26.7	98.3	0.714	100.0							
B-2C	**U-1**	1.0 - 3.0'	27.8	91.2	0.847	88.5							
B-2C	**U-2**	3.0 - 5.0'	22.0	93.8	0.797	74.6							
B-2C	**U-3**	8.0 - 10.0'	31.2	93.0	0.812	100.0	1.7	5.2					
B-3C	**U-1**	1.0 - 3.0'	25.3	92.1	0.831	82.2							
B-3C	**U-2**	3.0 - 5.0'	25.0	94.1	0.791	85.4							
B-3C	**U-3**	8.0 - 10.0'	30.8	93.2	0.809	100.0	1.3	5.2					
B-4C	**U-1**	1.0 - 3.0'	30.9	90.3	0.866	96.4							
B-4C	**U-2**	3.0 - 5.0'	26.6	94.3	0.788	91.0							
B-4C	**U-3**	8.0 - 10.0'	27.2	97.0	0.737	99.5							
B-5C	**U-1**	1.0 - 3.0'	27.9	93.0	0.812	92.7							
B-5C	**U-2**	3.0 - 5.0'	23.4	102.2	0.649	97.5							
B-5C	**U-3**	8.0 - 10.0'	26.5	98.0	0.719	99.4	2.2	7.2	65	16	49		CH
B-5C	**SS-4**	13.5 - 14.6'	25.3										
B-6C	**U-1**	1.0 - 3.0'	29.8	91.7	0.838	95.9	1.8	7.0					
B-6C	**U-2**	3.0 - 5.0'	22.6	102.5	0.645	94.8							
B-7C	**U-1**	1.0 - 3.0'	25.7	96.0	0.755	91.9							
B-7C	**U-2**	3.0 - 5.0'	20.4	105.6	0.597	92.2							
B-7C	**U-3**	8.0 - 10.0'	28.1	95.9	0.757	100.0							

APPENDIX D

2021 Previous Olsson Borings

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Scale: n.t.s.	
Project No. C21-04157	
Approved by: JDP	
Date: 1/5/2022	

Boring Location Plan

Scannell Lee's Summit Building C
Lee's Summit, Missouri

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BOREHOLE REPORT NO. B-3

Sheet 1 of 1

PROJECT NAME **Scannell Lee's Summit Tudor Road**	CLIENT **Scannell Properties, LLC**
PROJECT NUMBER **021-04157**	LOCATION **Lee's Summit, Missouri**

☒ Split Spoon ■ Shelby Tube

APPROX. SURFACE ELEV. (ft): 977

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
			0								
	ROOT ZONE 0.3'										
975	***FAT CLAY*** *Stiff, reddish brown, moist, trace orgaincs* 3.0'			SS 1		6-7-8 N=15		29.1			
	Firm, reddish brown, moist		5	U 2				26.4	98.3		P.P. = 1.75
970	7.0'										
	LEAN CLAY *Firm, olive brown, shaley, very moist* 9.5'			SS 3		3-4-50/0"		30.7			
	LIMESTONE 10.5'		10								

REFUSAL AT 10.5 FEET

WATER LEVEL OBSERVATIONS	
WD	∇ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	6/2/21	FINISHED:	6/2/21
DRILL CO:	ALPHA OMEGA	DRILL RIG:	CME 55
DRILLER:	K. KEMPTON	LOGGED BY:	D. MARTIN
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-4

Sheet 1 of 1

PROJECT NAME **Scannell Lee's Summit Tudor Road**	CLIENT **Scannell Properties, LLC**
PROJECT NUMBER **021-04157**	LOCATION **Lee's Summit, Missouri**

■ Shelby Tube ☒ Split Spoon

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	APPROX. SURFACE ELEV. (ft): 971		0								
	ROOT ZONE ***0.3'***										
970	***FAT CLAY*** *Firm, dark brown, very moist, trace orgaincs*	▨		■ U 1			0.8	32.1	33.8		
	3.3'	▨									
	Firm, dark brown with reddish brown, moist	▨	5	☒ SS 2		2-3-4 N=7		27.5			
965		▨									
	8.5'	▨									
	LIMESTONE ***8.8'***			SS 3		50/0"					
	REFUSAL AT 8.8 FEET										

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	6/2/21	FINISHED:	6/2/21
DRILL CO:	ALPHA OMEGA	DRILL RIG:	CME 55
DRILLER:	K. KEMPTON	LOGGED BY:	D. MARTIN
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-5

Sheet 1 of 1

PROJECT NAME
Scannell Lee's Summit Tudor Road

CLIENT
Scannell Properties, LLC

PROJECT NUMBER
021-04157

LOCATION
Lee's Summit, Missouri

■ Shelby Tube ☒ Split Spoon

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
975	**APPROX. SURFACE ELEV. (ft):** 975		0								
	ROOT ZONE ***0.3'***										
	FAT CLAY	▨									
	Very stiff, dark brown, moist, trace orgaincs ***2.5'***	▨		■ U 1			2.0	29.7	92.7		
	Stiff, reddish brown, moist	▨		☒ SS 2		3-4-6 N=10		24.9			
970		▨	5								
	6.9'	▨									
	LIMESTONE ***7.5'***										

REFUSAL AT 7.5 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	6/2/21	FINISHED:	6/2/21
DRILL CO.:	ALPHA OMEGA	DRILL RIG:	CME 55
DRILLER:	K. KEMPTON	LOGGED BY:	D. MARTIN
METHOD: CONTINUOUS FLIGHT AUGER			

olsson

BOREHOLE REPORT NO. B-6

Sheet 1 of 1

PROJECT NAME **Scannell Lee's Summit Tudor Road**	CLIENT **Scannell Properties, LLC**
PROJECT NUMBER **021-04157**	LOCATION **Lee's Summit, Missouri**

☒ Split Spoon ■ Shelby Tube

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	APPROX. SURFACE ELEV. (ft): 976	0								
	ROOT ZONE 0.3'									
975	***FAT CLAY*** *Firm, dark brown, very moist, trace orgaincs*		☒ SS 1		2-3-5 N=8		31.5			
	4.0'		■ U 2				24.8	101.9		P.P. = 3.75
	LEAN CLAY *Stiff, reddish brown, moist*	5								
970										
	7.5'									
	SHALE *Olive brown with gray*									
	8.8'		☒ SS 3		50/5"		27.2			
	▼ ***LIMESTONE***	10								
	10.5'									
965	***CLAY FILLED JOINT*** 10.7'									
	LIMESTONE 11.0'									
	REFUSAL AT 11.0 FEET									

WATER LEVEL OBSERVATIONS	
WD	▽ 9.0 ft
IAD	▼ 9.0 ft
AD	▼ Not Encountered

OLSSON, INC.
1700 E. 123RD STREET
OLATHE, KANSAS 66061

STARTED:	6/2/21	FINISHED:	6/2/21
DRILL CO.:	ALPHA OMEGA	DRILL RIG:	CME 55
DRILLER:	K. KEMPTON	LOGGED BY:	D. MARTIN
METHOD: CONTINUOUS FLIGHT AUGER			

LEE’S SUMMIT LOGISTICS – BUILDING No. 3

Lee’s Summit, Missouri - 2022

April, 2022

Olsson Project No. C21-04157