Geotechnical Engineering Report

August 1, 2025

The Residence at Carter Lake
Carter Lake, Iowa
ISG-TEAM No. 71-73

Prepared for:
Snyder & Associates
231 Bennett Avenue
Council Bluffs, IA 51503

Prepared by:
ISG-TEAM, Inc.
4722 South 135th Street
Omaha, NE 68137

August 1, 2025

Snyder & Associates
231 Bennett Avenue
Council Bluffs, IA 51503

Attn: Elizabeth Hunter, PE, AICP, LEED AP

Re: Geotechnical Exploration
The Residence at Carter Lake
Carter Lake, IA
ISG-TEAM Project No. 71-73

Dear Ms. Hunter:

We have completed the subsurface exploration for the Residence at Carter Lake project in Carter Lake, Iowa. The accompanying geotechnical report presents the findings of the subsurface exploration and our recommendations concerning geotechnical design and construction for the proposed building and paving.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service to you in any way, please do not hesitate to contact us.

Sincerely,
ISG-TEAM, Inc.

Nicholas Gilles, P.E
Sr. Project Engineer

LICENSED PROFESSIONAL ENGINEER NICHOLAS M. GILLES 21385 ★ IOWA ★	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. 8-1-25
	Nicholas M. Gilles, P.E. License Number 21385 Date: 8/1/2025 My license renewal date is December 31, 2025. Pages covered by this seal: All Pages .

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PROJECT INFORMATION

Project information has been provided by Snyder & Associates in correspondence with our Mr. Dan Snyder. Site plans, floor plans, and building elevations were also provided. We understand the project will consist of a new, three-story senior living facility and associated site development near the intersection of Avenue K & North 9th Street in Carter Lake, Iowa. The building will be constructed using conventional reinforced concrete footings and wood framing. Structural loads had not been provided at the time of this report. We have assumed that maximum column and wall loads will be on the order of 75 kips and 6 klf, respectively. We have also assumed that minimal cut and fill will be required to achieve the desired final grades.

SITE CONDITIONS

The project site is located northeast of the intersection of Avenue K & North 9th Street in Carter Lake, Iowa. The site is currently an open grass lot with less than 2 feet of elevation change based on topographic maps. Our truck-mounted drill rig was able to access the boring locations without difficulty.

FIELD EXPLORATION

A total of 12 borings were conducted at this site to depths of about 5 to 25 feet below existing grades between July 11 and 21, 2025. The boring locations were determined in the field by ISG-TEAM personnel using the provided site plan and measurements from existing site features. The final boring locations are indicated on the Boring Plan enclosed in the Appendix. Ground surface elevations at the boring locations were estimated using LiDAR elevation maps. The approximate ground surface elevations are provided on their respective Boring Logs. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

Our drilling equipment consisted of a truck-mounted auger drill rig. The borings were made by mechanically twisting a continuous flight steel auger into the soil. At assigned intervals, the auger was removed and soil samples were obtained.

Representative samples were obtained using thin walled (Shelby) tube and split barrel sampling procedures in general accordance with ASTM Specifications D 1587 and D 1586, respectively. In the thin walled tube sampling procedure, a thin walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the ground to obtain relatively undisturbed samples of cohesive or moderately cohesive soils. In the split barrel sampling procedure, a standard 2 inch outer diameter split barrel sampling spoon is driven into the ground with a 140 pound hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18 inch penetration is recorded as the standard penetration resistance value. These values are indicated on the Boring Logs at the depths of occurrence. The samples were tagged for identification, sealed and returned to the laboratory for testing and classification.

Field logs of the borings were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling, as well as the driller's interpretation of the subsurface conditions between samples. Final Boring Logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

LABORATORY TESTING

Based on the driller's field records and examination of the samples in the laboratory, a soil testing program was developed to collect more information about the soil conditions at the site. The following is a brief description of the specific tasks completed for this project.

Natural Moisture Content -- The natural moisture content of selected samples was determined in general accordance with ASTM D 2216. The moisture content of the soil is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the soil particles. The results are presented on the Boring Logs at the depths from which the samples were obtained.

Unit Weight -- In the laboratory, selected undisturbed samples of the site soils were measured and weighed to determine gross weight and volume of the samples. Where possible, the samples are placed in a template and trimmed at each end to fit the template. The moisture content of each specimen was then determined, and the dry unit weight was calculated. The results of these tests are also presented on the Boring Logs at the appropriate sample depths.

Unconfined Compressive Strength -- Selected cohesive soil samples obtained with 3 inch diameter Shelby tubes were tested in the laboratory to determine their unconfined compressive strength in general accordance with ASTM D 2166. In this procedure, sections of the Shelby tube samples were trimmed to fit into a 2.875 inch diameter by 5.70 inch high template and placed, without any confinement, in a triaxial load frame and tested for compressive strength with a controlled rate of strain. The peak stress on the samples, in psf, is reported on the Boring Logs at the depth from which the samples were obtained. A calibrated hand penetrometer was used to estimate the approximate unconfined compressive strength of the remaining samples. The calibrated hand penetrometer has been correlated with unconfined compression tests and provides a better estimate of soil consistency than visual examination alone.

As part of the testing program, the samples were classified in the laboratory based on visual observation, texture and plasticity. The descriptions of the soils indicated on the Boring Logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are given on the Boring Logs. A brief description of this classification system is attached to this report.

SUBSURFACE CONDITIONS

Subsurface conditions encountered during this exploration are indicated on the individual Boring Logs. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows.

Existing fill and possible fill were encountered at the ground surface in many of our borings. The term possible fill is used to describe soils that may be natural but either had a characteristic such as color or texture that were not anticipated for the location or the surrounding grades indicate that fill has been placed in the area. The fill and possible fill consisted of lean clay and silty sand. Where encountered, the fill and possible fill extended to depths of about 2 to 3 feet below existing grades.

Alluvial deposits were encountered below the fill and possible fill or topsoil in the borings. Alluvial soils have typically not experienced significant overburden pressures beyond the weight of the soil above them, below the zone of soil affected by seasonal wet/dry cycles (where some preconsolidation by desiccation has occurred). The alluvium is often near-normally consolidated and can be highly compressible under moderate to heavy loads. The cohesive alluvial soils at the site generally consisted of soft to stiff sandy silt, silt, and lean clay. The granular alluvium consisted of loose to dense silty sand and clayey sand. Borings were terminated in the alluvial deposits at depths of 5 to 25 feet below existing grades.

The above descriptions provide a general summary of the subsurface conditions encountered. The attached Boring Logs contain detailed information recorded at each boring location. These Boring Logs represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries, and the transition between strata may be gradual. It should be noted that the soil conditions will vary between the boring locations.

GROUNDWATER CONDITIONS

The borings were monitored during drilling operations for the presence and level of groundwater accumulation. Groundwater levels observed in the borings are noted on the Boring Logs.

During and immediately following drilling operations, groundwater seepage was observed at depths ranging from about 6 to 15 feet below existing grades. These short-term water level observations provide an approximate indication of the groundwater conditions existing on the site at the time the borings were drilled. Due to the low permeability of the cohesive soils encountered in the upper portion of the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole. Longer term monitoring in cased holes or piezometers would be required for a more accurate evaluation of the groundwater conditions at the site. Based on coloring of the soils and our experience in the area, we believe that groundwater levels may be within several feet of the ground surface during some periods of the year.

Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, surface drainage, subsurface drainage, site topography, irrigation practices, ground cover (pavement or vegetation), and other factors not evident at the time the borings were conducted. Normally, the highest groundwater levels occur in late winter and spring time while the lowest levels occur in late summer and fall time. The fluctuation of the groundwater levels should be considered when developing the design and construction plans for this project.

CONCLUSIONS AND RECOMMENDATIONS

Existing Fill Considerations

Existing fill and possible fill were encountered at the ground surface in many of our borings. The term possible fill is used to describe soils that may be natural but either had a characteristic such as color or texture that were not anticipated for the location or the surrounding grades indicate that fill has been placed in the area. The fill and possible fill consisted of lean clay and silty sand. Where encountered, the fill and possible fill extended to depths of about 2 to 3 feet below existing grades. Based on our field and laboratory testing, the fill appears to be moderately to well compacted.

It should be recognized that man-made fills have an inherently high risk of variability and careful construction inspection will be necessary to assure adequate support performance. Where fill is present below the structure and paving following earthwork operations, we recommend that additional testing be conducted at the time of construction to further explore the suitability of the existing fill. Foundations, floor slabs, and pavements may be placed on existing fill where testing confirms suitability. If unsuitable soils are encountered, these soils should be removed and replaced with engineered compacted and tested fill. It should be noted that the most conservative approach in dealing with unknowns within the existing fill would be to completely remove the fill and replace it with engineered compacted and tested fill, which eliminates the risk entirely.

Contract allowances should be made for some remedial work at the site related to subgrade preparation and foundation construction. This may include overexcavation and backfilling of unsuitable soils encountered at subgrade elevation or in the foundation excavations in accordance with the recommendations of this report or lowering of the foundations to suitable bearing materials. The amount of such work cannot be defined at this time; therefore, the owner should be informed of these cost variables.

Compressible Alluvial Soils

Alluvial soils were encountered below the fill and possible fill in our borings. These deposits generally consisted of soft to medium stiff cohesive soils and loose sands. These deposits have received little to no previous preconsolidation and can be highly compressible under moderate to high bearing pressures. To reduce settlement to acceptable levels, relatively low bearing pressures are typically recommended. If higher bearing pressures are desired, overexcavation and replacement of the alluvial soils may be performed to increase the bearing capacity and decrease the amount of settlement below foundations. Alternatively, foundations may be supported on a ground improvement system or intermediate foundation system. Additional details regarding these options can be found in the **Shallow Foundation Design**, **Shallow Foundation Construction**, and **Ground Improvement System** sections of this report.

The alluvial soils are generally suitable for support of lightly loaded floor slabs and pavements. However, these materials are highly susceptible to disturbance from construction equipment when moist and may require stabilization with fly ash, cement or lime. The use of crushed rock with or without geogrid could also be considered in-lieu of the additional stabilization methods. Contract allowances should be made for some remedial work at the site related to subgrade preparation. The amount of such work will be highly dependent on weather conditions and the type of construction equipment utilized, which cannot be defined at this time. Therefore, the owner should be informed of these cost variables.

Site Preparation

Site preparation should begin with the removal of any organic-laden soils, vegetation and any loose, soft or otherwise unsuitable materials. Unsuitable existing fill should be removed at this time, where encountered. For planning purposes we expect topsoil/vegetation stripping depths on the order of 6 inches. The actual depths of stripping may vary and should be determined in the field in consultation with ISG-TEAM personnel. The site strippings and any near surface soils with organics could be used for landscaping purposes in non-critical areas where support for foundations, floor slabs and pavements is not required.

After stripping and removal of any unsuitable soils, the exposed grade should be proofrolled and inspected by ISG-TEAM personnel. Proofrolling should be performed at the lowest cut grade, prior to any fill placement. Proofrolling should be conducted with a fully loaded tandem axle dump truck having a minimum gross weight of 25 tons. Where proofrolling is not possible due to poor access or excessive disturbance to existing soils, these soils should be probed and visually inspected by ISG-TEAM to determine the suitability of the subgrade. Any unsuitable soils identified during this process should be removed and replaced with suitable engineered compacted and tested fill which meets Class 1 Construction Application requirement in Table A in the following **Fill Placement** section.

It should be noted that initial subgrade preparation for the moist cohesive soils encountered at this site will likely not be suitable under repeated heavy construction vehicle loads and may require stabilization to greater depths or stabilization with fly ash, cement or lime. The use of crushed rock with or without geogrid could also be considered in-lieu of the additional stabilization methods. Contract allowances should be made for some remedial work at the site related to subgrade preparation. The amount of such work cannot be defined at this time; therefore, the owner should be informed of these cost variables.

Fill Placement

Fill and backfill placed for support of the proposed structure should consist of approved materials which are free of organic matter and debris. Brick, concrete, rocks or other solid pieces with a maximum dimension of 3 inches or larger should not be placed in the newly placed fill sections. We recommend that low-plasticity cohesive soil or granular soil be used for general fill placement. By our definition, low-plasticity cohesive soil would have a liquid limit of 45 or less and a plasticity index of 25 or less. In our opinion, most of the on-site soils appear to meet these criteria and can be reused as engineered fill for general earthwork purposes. Any off site potential borrow materials should be evaluated by ISG-TEAM prior to their use as engineered compacted and tested fill.

The following Table A lists recommended minimum compaction requirements for cohesive and cohesionless fill materials for specific applications. For low-plasticity (CL and ML) cohesive soils, moisture contents within a range of 0 to +4 percent of the material's optimum moisture content (as determined by Standard Proctor ASTM D 698) are necessary to achieve the desired fill qualities for general grading and utility backfill. Sometimes, cohesive subgrade soils have difficulty passing proofroll or supporting construction traffic if significantly wet of optimum. For the upper 2 feet of subgrade soils, it can be permissible to place the cohesive soils up to 2 percent dry of optimum moisture content. Granular materials with sufficient fines content to be moisture-sensitive should be placed within 3 percent of the material’s optimum moisture content. Clean granular materials are not moisture sensitive.

The on-site soils can be excavated utilizing conventional excavation equipment. Compaction of granular soils can generally be suitably compacted with vibratory compaction equipment. Proper compaction of cohesive soils can be achieved with sheepsfoot or pneumatic type compactors within the above moisture content ranges. The soils should be placed in a maximum loose thickness of 12 inches and at a thickness compatible with the equipment being utilized. Sufficient density tests should be performed on each lift of engineered compacted fill placed to verify that adequate compaction is achieved.

TABLE A
RECOMMENDED DEGREE OF COMPACTION GUIDELINES

Construction Application		Standard Proctor (ASTM D698) Cohesive Soil	Standard Proctor (ASTM D698) Cohesionless Soil [2]	Relative Density (ASTM D4253 & D4254) Cohesionless Soil [1,2]
Class 1	Subgrade preparation for structures, pavements and other critical backfill areas	95%	98%	75%
Class 2	Backfill adjacent to structures not supporting other structures or pavements. Minor subsidence possible.	90%	93%	45%
Class 3	Backfill in non-critical areas. Moderate subsidence possible.	85%	88%	20%

1. Use Relative Density technique (ASTM D4253 & D4254) where Standard Proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.
2. Clean gravel should be inspected visually during compaction by a qualified engineering technician to confirm adequate compactive effort and appropriate lift thicknesses in lieu of density testing.

The moist cohesive soils at this site are highly susceptible to disturbance. Care should be taken to prevent unnecessary disturbance of subgrade soils. Disturbed areas should be removed and replaced with new fill placed and compacted in accordance with the recommendations of this report. In order to minimize disturbance of these soils, measures should be taken to control groundwater infiltration in accordance with the **Construction Dewatering** section of this report. A layer of crushed rock may be placed to provide a working surface where excavations extend into soils that are susceptible to disturbance.

Upon completion of the filling operation, care should be taken to maintain the subgrade moisture content prior to construction of foundations or slabs if these elements are to be placed on or near cohesive soils. If the subgrade should become desiccated, frozen or otherwise disturbed, the affected material should be removed or these materials should be scarified, moistened, recompacted and retested prior to concrete or asphalt placement. As a general guideline, cohesive fills which dry to a moisture content less than 2/3 of their optimum moisture content as determined by the Standard

Proctor Test (ASTM D 698) in their upper 2 inches are candidates for reconditioning as described above.

Shallow Foundation Design

As previously discussed, existing fill and low-strength alluvial soils are present at this site near the foundation bearing elevation. To ensure that settlement is reduced to acceptable levels, we recommend that footings bearing directly on these relatively low strength materials be designed for a bearing pressure of 1,500 psf or less.

If higher bearing pressures are desired, some of the subgrade soils may be suitable depending on the bearing elevations, but we expect that an overexcavation and replacement procedure will likely be required in a significant portion of the building to increase the bearing capacities. The depth of the overexcavation and replacement below the footing should at least ½ of the footing's width (i.e. a 2-foot wide wall footing would require 1 foot of over-excavation below the footing). Where stiff natural soils are present to an adequate depth below foundations or where overexcavation and replacement is performed according to the recommendations of this report, foundations may be designed for a net allowable bearing pressure of up to 2,000 psf. Please see the **Shallow Foundation Construction** section for further details regarding overexcavation procedures.

This net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure and applies to the maximum dead load plus the sustained live load. The bearing pressure may be increased 33 percent for the effects of transient loads such as earthquake or wind loads. Where foundations are constructed according to these recommendations, we estimate that the maximum settlement for the shallow foundations will be on the order of 1 inch with a differential settlement of 2/3 inch based on our assumptions for the maximum structural loads.

Continuous foundations should be adequately reinforced to limit deflections caused by non-uniform soil support characteristics. All perimeter foundations and foundations in unheated areas should extend at least 42 inches below the lowest adjacent finished grade for frost protection and reduce movements associated with changes in soil moisture content. Interior footings located in permanently frost-free environments should have at least 18 inches of protective embedment below lowest adjacent finished grade. We recommend that isolated spread footings should have a minimum width of 24 inches, continuous formed footings a minimum width of 16 inches and trench footings a minimum width of 12 inches. Trench footings are not recommended where granular materials or very soft soils will be encountered in the excavation sidewalls.

Shallow Foundation Construction

We recommend that the base of all foundations and excavations beneath structural areas be observed and tested by the geotechnical engineer prior to fill placement and/or placement of concrete. Where loose, soft, organic, or otherwise unsuitable soils are encountered, these unsuitable materials should be removed to a depth determined by ISG-TEAM (generally equal to ½ of the footing width but deeper overexcavation may be required if poorly compacted fill or exceptionally soft natural soils are present to greater depths) and replaced with suitable engineered compacted fill soils prepared in accordance with the recommendations in Table A in the **Fill Placement** section of this report. Granular fill soils are often easier to place and compact in areas of soft soils. Only clean granular materials should be used where groundwater seepage is present. The following Figure 1 shows a typical cross sectional view of this over-excavation and backfill procedure.

In general, the over-excavation is widened 2/3 of a foot laterally on each side of the foundation per each foot of excavation that is below the foundation bearing elevation. The depth of over-excavation (shown as "D" in Figure 1) should be determined in consultation with the geotechnical engineer. Backfill materials should be suitable cohesive or granular soil, prepared and compacted in accordance with the recommendations in Table A in the **Fill Placement** section of this report.

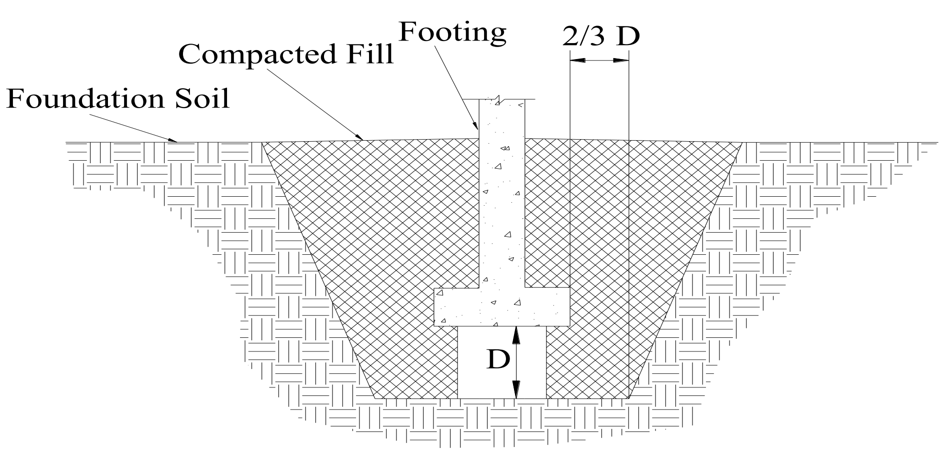


Figure 1.

Footing excavations should be kept free of water accumulation to prevent softening of subgrade materials and conducted in a manner which avoids disturbance of soils beneath existing foundations. The soils at this site are highly susceptible to disturbance when wet. Any disturbed soils may require additional removal or compaction prior to concrete or backfill placement. It may be beneficial to place a lift of crushed rock in excavations to provide a suitable working surface and prevent disturbance of the foundation subgrade. Concrete should be placed as soon as possible after providing an approved bearing grade to minimize bearing soil disturbance. Should the soils at bearing level become excessively dry, saturated, or otherwise disturbed, the affected soil should be removed prior to placing concrete.

Ground Improvement System

If the aforementioned overexcavation and replacement of existing fill is not desirable or the relatively low bearing pressures recommended do not produce economical foundation sizes, a ground improvement system, such as stone columns or Geopiers®, or an intermediate foundation system, such as helical piers or micropiles, could be used to support the proposed buildings. These foundation systems are typically designed by specialty contractors who have a professional engineer on staff. We recommend that the ground improvement or intermediate foundation consultant be provided a copy of this report to determine requirements for additional exploration, if any, to support their design work. The foundation contractor should submit their proposed solution to ISG-TEAM for review.

Floor Slabs

Interior floor slabs can be adequately supported on a subgrade prepared in accordance with the **Existing Fill Considerations**, **Site Preparation**, and **Fill Placement** sections of this report. As previously discussed, there are some risks associated with the undocumented existing fill soils at this site if the owner choses to leave them in place below the structure. The risks to floor slabs can be reduced with careful construction inspections.

During building construction, the surface of the completed building pad may have been disturbed by construction equipment. Therefore, it is recommended that the building areas be proofrolled or probed and tested where proofrolling cannot be conducted to delineate zones of soft soils present near the surface which may require additional removal or compaction prior to construction of the floor slab. If the exposed subgrade has been disturbed since the original subgrade preparation, the subgrade should be scarified to a minimum depth of 9 inches, moisture conditioned (if needed), and recompacted to meet or exceed the Class 1 Construction Application requirement given in Table A in the **Fill Placement** section. It should be noted that the initial subgrade preparation for the cohesive soils at this site may not be suitable under repeated heavy construction vehicle loads and may require stabilization to greater depths or stabilization with fly ash, cement or lime. The use of crushed rock with or without geogrid could also be considered in-lieu of the additional stabilization methods.

To avoid localized slab failures, it is important that interior backfill around foundations and in plumbing trenches be properly compacted. Therefore, all fill materials placed beneath the proposed floor slab are to meet or exceed the Class 1 Construction Application requirement given in Table A.

We recommend that continuous wire mesh reinforcement or a regular rebar schedule be considered for the floor slabs and that crack control joints be sawn with a regular spacing not greater than about 10 feet. Isolation joints should be considered between the floor slabs and perimeter or interior foundations so that they can move independently without damage. These measures are taken with the intent of allowing the floor slab to deflect somewhat without experiencing large differential movements across slab joints and to channel the cracking of the floor slabs to the crack control joints so that they are not perceived as structure distress.

In order to allow successful use of a variety of floor systems, measures to control vapor transmission through the floor slab are recommended where moisture sensitive floor coverings are a possibility. This would include use of a vapor barrier/retarder with a minimum thickness of 10 mils placed between the slab and an underlying capillary break material. The vapor barrier/retarder should be strong enough to resist puncturing by the capillary break materials.

We recommend that the capillary break consist of clean manufactured sand or crushed limestone (drainable material). The capillary break should be at least 4 inches thick and contain less than 6 percent material finer than the U.S. No. 200 sieve. Floor slabs which are protection from frost action may be designed with a modulus of subgrade reaction of 100 pci when subgrade soils, subbase, and capillary breaks are constructed in accordance with the recommendations of this report.

Construction Groundwater Control

During construction activities, care should be taken to maintain positive drainage at the site to ensure that drainage is directed away from excavations. We anticipate that the groundwater level will be within a few feet of the ground surface during some periods of the year based on color of the soil. Where seepage is encountered or during times where high groundwater is anticipated, we recommend that construction groundwater control be established prior to excavating the final 2 feet of soil above the final desired final elevation. Groundwater seepage in cohesive soils can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations. Groundwater seepage in granular soils may be controlled with a system of well points.

Moist cohesive soils can be susceptible to disturbance, especially when moist. During times of wet weather or groundwater seepage, the contractor should consider placing a lift of at least 6 inches of clean, crushed concrete or limestone gravel in excavations to provide a firm working surface for constructing foundations and floor slabs. The clean gravel can be well compacted in the presence of water, will drive through and reinforced shallow cohesive soils which have become softened by water exposure, and can accumulate water seepage to flow to a peripheral sump pit to be pumped out of the excavation area.

If groundwater control is lost during construction, disturbance of the upper few inches to few feet below grade is possible in the soils at the site. In these circumstances, it will be necessary to reestablish groundwater control and remove the disturbed soils. ISG-TEAM should be consulted regarding the extent of remedial action which is necessary.

Site Drainage

Positive site drainage should be maintained along the perimeter of the structure. Final grades should be established to direct runoff away from structure foundations. Down spouts, gutters, and roof drains should discharge away from structure perimeters. Site grading should direct surface water away from excavations or completed foundations during construction and after site development is completed.

Pavement Subgrade Preparation

We expect the soils which will be encountered to support the pavement sections will consist of existing fill and natural alluvial soils in cut areas and engineered compacted and tested fill required to achieve the desired final grades in fill areas. In order to provide satisfactory pavement performance, it is important that the subgrade support be relatively uniform with no abrupt changes in the subgrade support. Therefore, we recommend that the prepared subgrade depth be at least 12 inches deep after surface stripping and fine grading or trimming and extend 2 feet beyond the edge of the pavements.

In cut areas, it is recommended that the pavement subgrade area be cut to design subgrade level or stripping depth (whichever is deeper) and that the exposed subgrade be scarified to a minimum depth of 12 inches, moisture conditioned (if needed), and compacted. In fill areas, the subgrade after stripping should be proofrolled to delineate zones of soft or loose soils present near the surface which may require additional removal or compaction, prior to fill placement. We recommend that reworked existing soils and newly placed engineered compacted non-expansive cohesive soils be placed and compacted in accordance with the **Fill Placement** section of this report. Suitable engineered compacted cohesive subgrade that passes a proofroll inspection would provide a design support capability equivalent to a CBR value of 2 or a modulus of subgrade reaction value of 100 pounds per cubic inch. A minimum of six inches of suitable engineered compacted granular subgrade placed on prepared and inspected cohesive soils would provide a design support capability equivalent to a CBR value of 3 or a modulus of subgrade reaction value of 150 pounds per cubic inch.

It should be noted that initial subgrade preparation for moist cohesive soils, which were prevalent at this site, may not be suitable under repeated heavy construction vehicle loads and may require stabilization to greater depths or stabilization with fly ash, cement or lime. The use of crushed rock with or without geogrid could also be considered in lieu of the additional stabilization methods. The subgrade preparation should be completed shortly before paving operations commence and is to be maintained in suitable condition until paved. Damage caused by construction traffic or deterioration due to adverse weather are to be repaired prior to paving. Subgrade compaction, moisture content and depth should be verified by an ISG-TEAM representative prior to paving operations.

Where construction traffic is required on the prepared subgrade, the subgrade should be proofrolled immediately prior to pavement placement with a fully loaded, tandem axle dump truck. Proofrolling is also the preferred method for evaluating the stability of surficial existing fill soils. Areas that yield should be removed and replaced with engineered compacted and tested fill.

Surface drainage around the pavement sections is important to long-term pavement performance. Curbs should be backfilled as soon as possible, once adequate pavement strength is achieved. The backfill should be compacted and sloped to prevent water from ponding and infiltrating under the pavement resulting in softening of the subgrade or subsurface erosion. Water allowed to pond adjacent to the pavement could saturate the subgrade and contribute to premature pavement deterioration.

Pavement Thicknesses

Either flexible (hot mix asphalt, HMA) or rigid pavement (Portland cement concrete, PCC) types could be constructed on the prepared cohesive subgrade as recommended in the previous section. The following Table B summarizes alternate pavement thicknesses for typical lightly-loaded and heavily-loaded paved areas constructed directly on the cohesive subgrade and on a granular base placed on the prepared cohesive subgrade. A more specific pavement evaluation can be provided if traffic volume and loading information is available.

TABLE B
TYPICAL PAVEMENT THICKNESSES

Traffic Volume	Rigid: Portland Cement Concrete [1]	Flexible: Full-Depth Hot Mix Asphalt [2]			
		Full-Depth Type A HMA	Type A over Type B HMA		
			Type A	Type B Class I Base	Total HMA Thickness
Thicknesses below are based on the pavement directly on the prepared cohesive subgrade					
Lightly-Loaded [3]	5"	6"	1.5"	5"	6.5"
Heavily-Loaded [4]	7"	8"	1.5"	7"	8.5"
Thicknesses below are based on the pavement on 6" of crushed rock [5] base placed on prepared subgrade					
Lightly-Loaded [3]	---	4.5"	1.5"	3.5"	5"
Heavily-Loaded [4]	---	6.5"	1.5"	5.5"	7"

1) PCC - Flexural strength of 550 psi (compressive strength of 4000 psi).
   - Structural coefficient (SC) of 0.50/inch.
2) Type A HMA mix with a minimum of 60% crushed aggregate
   - Structural coefficient of 0.44/inch.

   Type B Class I HMA mix with a minimum of 30% crushed aggregate
   - Structural coefficient of 0.40/inch.
3) Automobile and 1 to 2 trucks average daily traffic.
4) Entrances, delivery areas, dumpster areas or other areas of heavier truck traffic (25 trucks or less per day).
5) Crushed rock - Structural coefficient of 0.12/inch.

These pavement thicknesses are considered to be typical and would require periodic maintenance. This maintenance would consist of sealing cracks and replacement of isolated distressed areas. Thicker pavement sections would reduce maintenance and increase the pavement service life. Likewise, thinner sections would be expected to have a shorter service life that still may satisfy particular project needs but may require more maintenance. Other criteria which influence pavement service life include surface drainage, subsurface drainage, paving material quality, and joint design. Construction procedures involving placement, finishing, curing, jointing and weather protection can significantly impact pavement performance.

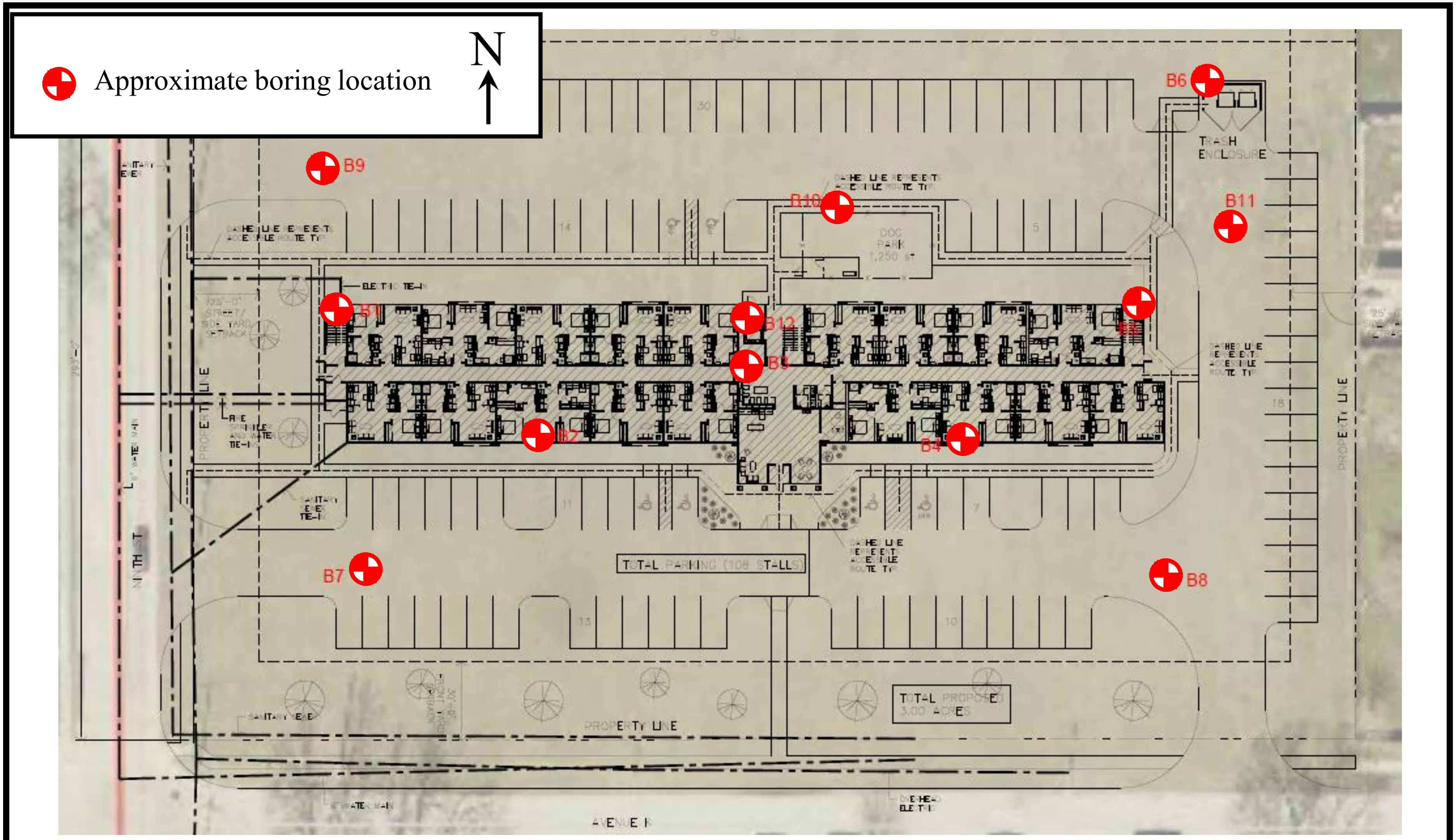
QUALIFICATION OF REPORT

Our evaluation of foundation support conditions has been based on our understanding of the site and project information and the data obtained in our exploration. The general subsurface conditions utilized in our foundation evaluation have been based on interpolation of subsurface data between the borings. In evaluating the boring data, we have examined previous correlations between soil properties and foundation bearing pressures observed in soil conditions similar to those at your site. Slope stability was not analyzed for this site. The discovery of any site or subsurface conditions during construction which deviate from the data outlined in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions or the presence of pollutants in the soil, rock, and groundwater of the site was beyond the scope of this exploration.

Support of structures on existing fill is discussed in this report. Existing fills are potentially much more inconsistent than natural soil deposits. Support of structures and pavements upon existing fills carries with it a degree of risk that unsuitable materials may be buried within the fill and not be detected in the inspection and testing program recommended herein. Unsuitable materials in the fill may experience settlement and cause distress to structures and pavements supported on the fill. Elimination of this risk requires removal of the fill or supporting structures on suitable foundations such that the fill would not adversely affect the structures.

It is recommended that the geotechnical engineer be retained to review the plans and specifications so that comments can be provided regarding the interpretation and implementation of the geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during the foundation construction phase to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty is provided. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.



ISG-TEAM, Inc.

4722 South 135th Street

Omaha, NE 68137

The Residence at Carter Lake

Carter Lake, Iowa

BORING PLAN

Project No. 71-73

August 1, 2025

BORING LOG No. 1

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 977.5
Site Datum:
Drilling Method: CFA

Depth (ft)	DESCRIPTION	Elevation	USCS SYMBOL
0.3	Grass/Topsoil	977.2	CL
2.0	Possible Fill -- Lean CLAY, trace organic matter, dark grayish brown	975.5	CL
3.0	Alluvium -- Lean CLAY, dark gray, very stiff	974.5	CL
12.0	Alluvium -- SILT, dark gray, soft to medium stiff	965.5	ML
20.0	Alluvium -- Silty SAND, dark brown	957.5	Sm
	Bottom of Boring		

SAMPLES: NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	TESTS: MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
1	ST			17.5	107	8210	
2	ST			22	94	690	
3	ST			31.4	96	500*	
4	ST			37.3	92		
5	ST			37.1	95		

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:
12 Ft. While Drilling
Ft. After Drilling
Ft.

Boring Started: 7/15/2025
Boring Completed: 7/15/2025
Rig: F550 **Foreman:** JA
Approved: NMG **Job #:** 71-73

ISG TEAM Geotechnical Construction Materials

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

71-73.geo TSBORE16.fdt 4/25/2017

BORING LOG No. 2

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: CFA

Depth	Description	Elev.	USCS Symbol	Depth (ft.)	Sample Number	Type	Recovery	SPT - N (Blows / Ft.)	Moisture, %	Dry Density (PCF)	Unconfined Strength (PSF)	Other
0.3	Grass/Topsoil	977.7	CL	0								
3.0	Possible Fill -- Lean CLAY, with sand, dark brown	975.0	CL		1	ST			15.5	106	7345	
7.0	Alluvium -- Lean CLAY, dark brown, soft to medium stiff	971.0	CL	4	2	ST			22.9	94	720	
12.0	Alluvium -- Sandy SILT, dark grayish brown, soft	966.0	ML	8	3	ST			34.1	93	500*	
20.0	Alluvium -- Silty SAND, dark grayish brown	958.0	SM	12, 16	4	ST			30.8	97		
				20	5	ST			36.9	98		
	Bottom of Boring											

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

12	Ft.	While Drilling
	Ft.	After Drilling
	Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/15/2025	
Boring Completed: 7/15/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 3

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: CFA

Depth	DESCRIPTION	Elev.	USCS SYMBOL	DEPTH (ft.)	SAMPLES: NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	TESTS: MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
0.3	Grass/Topsoil	977.7	CL	0								
2.0	Fill -- Lean CLAY, trace sand, dark brown	976.0	CL		1	ST			13.8	110	9150	
3.5	Alluvium -- Lean CLAY, dark gray, stiff	974.5	CL									
20.0	Alluvium -- Silty SAND, grayish brown	958.0	SM	4	2	ST			24.3	93	880	
				8	3	ST			35.9	94		
				12	4	ST			33.8	92		
				16	5	ST			33.8	97		
	Bottom of Boring			20								

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

▽	12	Ft.	While Drilling
▼		Ft.	After Drilling
▼		Ft.	

ISG TEAM — Geotechnical | Construction Materials

Boring Started: 7/15/2025	
Boring Completed: 7/15/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 4

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: CFA

Depth (ft)	DESCRIPTION	Elev.	USCS SYMBOL	SAMPLE NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
0.3	Grass/Topsoil	977.7	CL								
3.0	Fill -- Lean CLAY, dark brown	975.0	CL	1	ST			15	109	5960	
7.0	Alluvium -- SILT, dark brown, medium stiff	971.0	ML	2	ST			20.3	96	1240	
20.0	Alluvium -- Silty SAND, grayish brown	958.0	SM	3	ST			37.7	90		
				4	ST			34.5	93		
				5	ST			29.8	100		
	Bottom of Boring										

Depth scale (ft.): 0, 4, 8, 12, 16, 20

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:
- 15 Ft. While Drilling
- Ft. After Drilling
- Ft.

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/15/2025	
Boring Completed: 7/15/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 5

PROJECT: The Residence at Carter Lake

SITE: Carter Lake, IA

Approx. Surface Elevation (ft): 977.5
Site Datum:
Drilling Method: CFA

Depth (ft)	Description	Elevation	USCS Symbol
0.3	Grass/Topsoil	977.2	CL
3.0	Possible Fill -- Lean CLAY, dark brown	974.5	CL
7.0	Alluvium -- Lean CLAY, dark grayish brown, medium stiff	970.5	CL
12.0	Alluvium -- Clayey SAND, dark brown	965.5	SC
20.0	Alluvium -- Silty SAND, grayish brown	957.5	SM
	Bottom of Boring		

SAMPLES: NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	TESTS: MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
1	ST			13.6	111	6720	
2	ST			22.1	94	1420	
3	ST			35.2	94		
4	ST			32.2	96		
5	ST			28.3	108		

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

8	Ft.	While Drilling
	Ft.	After Drilling
	Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/17/2025	
Boring Completed: 7/17/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 6

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 977.5
Site Datum:
Drilling Method: CFA

Depth (ft)	Description	Elev.	USCS Symbol	Sample Number	Type	Recovery	SPT - N (Blows / Ft.)	Moisture, %	Dry Density (PCF)	Unconfined Strength (PSF)	Other
0.3	Grass/Topsoil	977.2	CL								
3.0	Possible Fill -- Silty SAND, dark brown	974.5	SM	1	ST			12.5	112	7460	
12.0	Alluvium -- Sandy SILT, grayish brown, medium stiff	965.5	ML	2	ST			24.6	93	1580	
				3	ST			34.1	95	1000*	
25.0	Alluvium -- Silty SAND, grayish brown	952.5	SM	4	ST			30.2	98		
				5	ST			28.3	105		
				6	SS		20	18.3			
	Bottom of Boring										

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

15	Ft.	While Drilling
	Ft.	After Drilling
	Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/17/2025	
Boring Completed: 7/17/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 7

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 977
Site Datum:
Drilling Method: CFA

DESCRIPTION	USCS SYMBOL	DEPTH (ft.)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N (BLOWS / FT.)	TESTS MOISTURE, %	TESTS DRY DENSITY (PCF)	TESTS UNCONFINED STRENGTH (PSF)	TESTS OTHER
0.3 — 976.7		0								
Grass/topsoil	CL		1	ST			13.7	87	1460	
3.0 — 974.0										
Fill -- Lean CLAY, dark brown and gray	CL	4	2	ST			10	87	880	
Bottom of Boring										

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

None Ft. **While Drilling**

Ft. **After Drilling**

Ft.

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/11/2025

Boring Completed: 7/11/2025

Rig: F550 **Foreman:** JA

Approved: NMG **Job #:** 71-73

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 8

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: JA

GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	DEPTH (ft.)	NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
	0.3 Grass/Topsoil 977.7	CL	0								
	Fill -- Silty SAND, dark brown	SM									
				1	ST			9.5	102	1870	
	3.0 975.0										
	Alluvium -- Sandy SILT, grayish brown, medium stiff	ML									
			4	2	ST			23	88	1290	
	5.0 973.0										
	Bottom of Boring										

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

▽	None	Ft.	While Drilling
▼		Ft.	After Drilling
▼		Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/11/2025	
Boring Completed: 7/11/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 9

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 977.5
Site Datum:
Drilling Method: CFA

Depth (ft)	DESCRIPTION	Elevation	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
0.3	Grass/Topsoil	977.2	CL								
3.0	Alluvium -- Lean CLAY, trace organic matter, dark brown	974.5	CL	1	ST			18.9	103	5720	
5.0	Alluvium -- SILT, grayish brown, soft to medium stiff	972.5	ML	2	ST			25.3	89	930	
	Bottom of Boring										

Depth scale (ft.): 0, 4

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

None Ft. **While Drilling**

Ft. **After Drilling**

Ft.

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/11/2025

Boring Completed: 7/11/2025

Rig: F550 **Foreman:** JA

Approved: NMG **Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 10

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: CFA

GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	DEPTH (ft.)	SAMPLES: NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	TESTS: MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
	0.3 Grass/Topsoil 977.7	CL	0								
	Alluvium -- Lean CLAY, trace organic matter, dark brown, medium stiff	CL		1	ST			9.7	95		
			4	2	ST			27.6	79	1260	
	5.0 973.0										
	Bottom of Boring										

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

While drilling symbol	None	Ft.	While Drilling
After drilling symbol		Ft.	After Drilling
		Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/11/2025	
Boring Completed: 7/11/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 11

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 977.5
Site Datum:
Drilling Method: CFA

GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	DEPTH (ft.)	SAMPLES: NUMBER	TYPE	RECOVERY	SPT - N (BLOWS / FT.)	TESTS: MOISTURE, %	DRY DENSITY (PCF)	UNCONFINED STRENGTH (PSF)	OTHER
	0.3 Grass/Topsoil 977.2	CL	0								
	Alluvium -- Lean CLAY, trace organic matter, dark brown, stiff	CL		1	ST			19.1	104	4310	
	3.0 974.5										
	Alluvium -- SILT, grayish brown, medium stiff	ML	4	2	ST			21.6	88	1240	
	5.0 972.5										
	Bottom of Boring										

Notes:

* Calibrated hand penetrometer

Hammer Type: NA

Water Level:

None Ft. **While Drilling**

Ft. **After Drilling**

Ft.

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/11/2025

Boring Completed: 7/11/2025

Rig: F550 **Foreman:** JA

Approved: NMG **Job #:** 71-73

71-73.geo TSBORE16.fdt 4/25/2017

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; IN-SITU, THE TRANSITION MAY BE GRADUAL.

BORING LOG No. 12

PROJECT The Residence at Carter Lake

SITE Carter Lake, IA

Approx. Surface Elevation (ft): 978
Site Datum:
Drilling Method: CFA

Depth	Description	Elev.	USCS Symbol	Depth (ft.)	Number	Type	Recovery	SPT - N (Blows / Ft.)	Moisture, %	Dry Density (PCF)	Unconfined Strength (PSF)	Other
0.3	Grass/Topsoil	977.7	CL	0								
2.0	Fill -- Lean CLAY, dark brown	976.0	CL		1	ST		13	14.6			
	Alluvium -- Silty SAND, dark brown, loose		SM	4	2	ST		7	25.2			
	-- becomes medium dense at about 7'			8	3	ST		11	32			
	(water level ▽ at 13 ft)			12	4	ST		28	36.1			
	-- becomes dense at about 17'			16	5	ST		50	38.7			
25.0		953.0		20, 24	6	SS		45	29.9			
	Bottom of Boring											

Notes:

* Calibrated hand penetrometer

Hammer Type: Manual

Water Level:

▽ 13	Ft.	While Drilling
▼	Ft.	After Drilling
▼	Ft.	

ISG TEAM Geotechnical Construction Materials

Boring Started: 7/21/2025	
Boring Completed: 7/21/2025	
Rig: F550	**Foreman:** JA
Approved: NMG	**Job #:** 71-73

UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

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

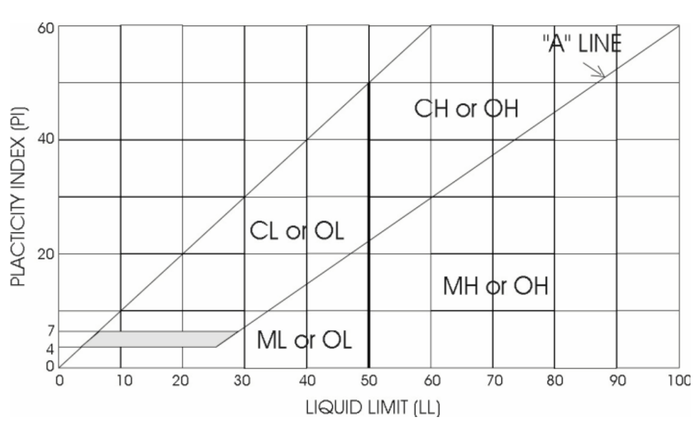
[E] $Cu = D_{60}/D_{10} \qquad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains > 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plots in shaded area, soil is a CL-ML, silty clay.

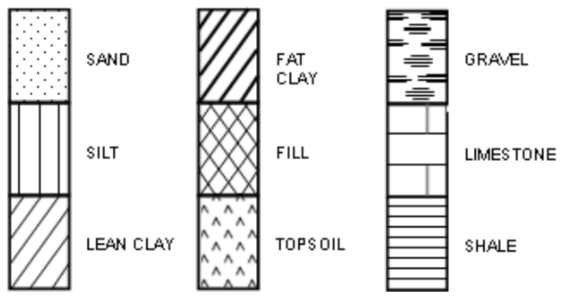
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI $\geq$ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.

For classification of fine-grained soils and fine grained fraction of coarse-grained soils.

Equation of "A" Line:
Horizontal at PI = 4 to LL + 25.5.
then PI = 0.73 (LL-20)



GENERAL NOTES

SOIL and ROCK TYPES	DRILLING & SAMPLING SYMBOLS
	**SS** Split Spoon - 1 1/2" I.D., 2" O.D., unless otherwise noted **ST** Thin-Walled Tube - 3" O.D., unless otherwise noted **PA** Power Auger **HA** Hand Auger **DB** Diamond Bit - 4", N, B **AS** Auger Sample **HS** Hollow Stem Auger **WS** Wash Sample **RB** Rock Bit **BS** Bulk Sample **DC** Dutch Cone **WB** Wash Bore **AR** Air Rotary

STRENGTH TERMS

CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing No. 200 sieve)			RELATIVE DENSITY OF COARSE-GRAINED SOILS (50% or more retained No. 200 sieve)	
Consistency	**Unconfined Compressive Strength, Qu, psf**	**N-Blows/ft* (Approx. Correlation)**	**Relative Density**	**N-Blows/ft. ***
Very Soft	< 500	0 - 2	Very Loose	0 - 4
Soft	500 - 1,000	3 - 4	Loose	5 - 10
Medium	1,001 - 2,000	5 - 8	Medium Dense	10 - 29
Stiff	2,001 - 4,000	9 - 15	Dense	30 - 49
Very Stiff	4,001 - 8,000	16 - 30	Very Dense	50 - 80
Hard	8,001 - 16,000	31 - 50	Extremely Dense	80 +
Very Hard	> -16,000	50 +		

* Standard "N" Penetration Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch OD split spoon, except where noted.

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) (of components also present in sample)	**Percent of Dry Weight**	**Descriptive Term(s) (of components also present in sample)**	**Percent of Dry Weight**
Trace	< 15	Trace	< 5
With	15 - 29	With	5 - 12
Modifier	> 30	Modifier	> 12

WATER LEVELS: WD = While Drilling AD = After Drilling

∇	Depth groundwater first encountered during drilling
▼	Groundwater level after 24 hours (unless otherwise noted, i.e. "AD" -- after drilling)

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Size Range
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300 mm to 4.75 mm)
Gravel	3 in. to #4 sieve (75 mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75 mm to 0.075 mm)
Silt or Clay	Passing #200 sieve (0.075 mm)

TERMS DESCRIBING SOIL STRUCTURE

Parting:	paper thin in size	Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical.
Seam:	1/8" to 3" in thickness		
Layer:	greater than 3" in thickness	Interbedded:	composed of alternate layers of different soil types.
Ferrous:	containing appreciable quantities of iron	Laminated:	composed of thin layers of varying color and texture.
Well-Graded:	having wide range in grain size and substantial amounts of all intermediate sizes.	Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.
Poorly-Graded:	predominately one grain size or having a range of sizes with some intermediate sizes missing.	NOTE:	Clays possessing slickensided or fissured structure may exhibit lower unconfined strength than indicated above. Consistency of such soil is interpreted using the unconfined strength along with pocket penetrometer results.