Cole Garner Geotechnical
1070 W. 124th Ave, Ste. 300
Westminster, CO 80234
303.996.2999

August 16, 2022

Commercial Building Services
7561 S. Grant Street
Littleton, Colorado 80122

Attn: Mr. David Spratlen II, AIA

Re: Geotechnical Engineering Report
Proposed Storage Yards
0 Space Village Avenue
El Paso County, Colorado
CGG Project No. 22.22.155

At your request, Cole Garner Geotechnical (CGG) has completed geotechnical engineering testing and analyses for the proposed storage yards to be constructed at the referenced site in unincorporated El Paso County, Colorado. This study was performed in general accordance with our proposal number P22.22.151, executed July 11, 2022.

Project Information: We understand that the project will include subdivision of the approximate 23-acre site into two lots that will be utilized as contractor storage yards. Building construction is not planned for the lots. We assume that drive lanes and storage yards will be gravel-surfaced. Some concrete-paved drive lane entrance areas are also anticipated.

We have no information regarding proposed grading but understand that the site will require some limited grading to promote stormwater drainage. Stormwater detention ponds are planned in the southern extents of each of the lots. Construction of proposed stormwater improvements will be performed following El Paso County and Mile High Flood District standards.

If our understanding of the project, or assumptions above, is not accurate, or if you have additional useful information, please inform us as soon as possible.

Field Exploration: We investigated the subsurface conditions on the site with a total of twelve (12) borings, as outlined in the table below. Borings were advanced with a truck-mounted drilling rig utilizing 4-inch diameter, solid stem auger at the approximate locations as shown on Figure 1 – Boring Location Diagram.

Structure or Site feature	Boring Designation	Geotechnical Exploration Scope	
		Number of Borings	Boring Depths (ft)
Lot Investigation Borings	L1 and L2	2	20 to 35
Pavements – Private Drive Entrances	P1 and P2	2	5
Stormwater Detention Ponds	Profile Borings: L1-DP and L2-DP	2	20
	Infiltration Test Holes: L1-IF1 through IF3 and L2-IF1 through IF3	6	5

A lithologic log of each boring was recorded by our field personnel during the drilling operations. At selected intervals, samples of the subsurface materials were obtained by driving modified California barrel samplers. Penetration resistance measurements were obtained by driving the sample barrel into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index to the consistency, relative density or hardness of the materials encountered.

Groundwater measurements were performed in each boring at the time of site exploration and again ten days later. Borings were backfilled with the spoils immediately following the subsequent groundwater measurements.

Double-ring infiltrometer testing was performed within the proposed stormwater detention areas (tests denoted as L1-IF1 through L1-IF3 and L2-IF1 through L2-IF3) at a depth of about 5 feet below existing site grades. Results of those tests are attached. Double-ring infiltration testing was performed in accordance with applicable local standards.

Laboratory Testing: Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer, and were classified in general accordance with the Unified Soil Classification System described in Appendix C. At that time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and Boring Logs were prepared.

Laboratory test results are attached to this report. Laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Water-soluble sulfates
- Grain size
- Plasticity Index

Site Conditions: The site is currently a vacant lot located at the southeast corner of Space Village Avenue and Command View in unincorporated El Paso County, Colorado. The site is bound by Space Village Avenue to the north, Peterson Air Force Base to the south, Command View and Colorado Military Academy to the west, and undeveloped land to the east. The site had been most recently utilized as open-air storage on the west portion of the site, as shown on the Google image of the Boring Location Diagram. The site appears relatively flat. Based on review of USGS topographic mapping, the surrounding area has a general downward slope to the south.

Geology: Surficial geologic conditions at the site, as mapped by the Colorado Geological Survey (CGS) ([1]Madole and Thorson, 2003), consist of Eolian Sand of Holocene and Pleistocene Age. These materials are reported to include fine to coarse sand.

Bedrock mapped in the area consists of the Dawson Formation of Upper Cretaceous, Paleocene, and Eocene Age. This formation within the area has been reported to include sandstone with interbedded claystone and conglomerate.

Mapping completed by the Colorado Geological Survey ([2]Hart, 1972) indicates the site is located in an area of "Windblown Sand or Silt". This category typically has low swell but the upper 6 to 12 inches may locally have moderate swell potential. Windblown material may be subject to settlement or hydro compaction when water is allowed to saturate the deposits. The soils encountered in our borings are non-expansive.

No other geologic hazards were identified. Seismic activity in the region is anticipated to be low. With proper site grading around proposed structures, erosional problems at the site should be reduced.

Soil Conditions: The soils encountered in our test borings consisted of fine to coarse sands with silt. The sand soils extended to the maximum depth of exploration. Other specific information regarding the subsurface conditions is shown on the attached Boring Logs.

[1] Madole, R.F., and Thorson, J.P., 2003, ***Geologic Map of the Elsmere 7.5 Minute Quadrangle, El Paso County, Colorado***, Colorado Geological Survey, Map OF-02-02.

[2] Hart, Stephen S., 1972, ***Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado***, Colorado Geological Survey, Sheet 3 of 4.

Field and Laboratory Test Results: The sand soils ranged from very loose to medium dense in relative density. The sands are non-plastic and non-expansive.

Groundwater Conditions: Groundwater was encountered in one of the borings (Boring No. L2) during exploration at a depth of about 16 feet below existing site grade. When checked again ten days later, two of the borings (as noted on the logs) had caved off so that measurement was not possible. Groundwater was not observed in the remaining borings at that time. Based upon review of U.S. Geological Survey Maps ([3]Hillier, et al, 1980), regional groundwater beneath the project area occurs in colluvial, landslide, and windblown deposits, and in consolidated sedimentary rocks, at depths generally ranging from 5 to 20 feet below the ground surface.

Earthwork:

- **General Considerations:** The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project.

  All earthwork on the project should be observed and evaluated by CGG or other geotechnical engineering and testing firm. The evaluation of earthwork should include observation and testing of engineered fills, subgrade preparation, foundation bearing soils and other geotechnical conditions exposed during the construction of the project.

- **Site Preparation:** Strip and remove existing vegetation and any other deleterious materials from proposed construction areas. Stripped materials consisting of vegetation and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

  The on-site soils are considered to be relatively stable based on the conditions at the time of our exploration, but stability may affected by precipitation, repetitive construction traffic, or other factors. Where unstable conditions, if any, are encountered or develop during construction, workability may be improved by scarifying and aeration during warmer periods. In some areas, removal and recompaction (or replacement with other on-site soils) may be suitable to build a stable base for placement of new fills.

  In areas where subgrade soils are very soft/yielding (if any), gravel augmentation (mechanically compacting/kneading crushed rock into the subgrade soils) may be cost-effective. In our experience, crushed rock or recycled concrete materials on the order of 3 to 6 inches in size would be effective in most situations. As an alternative, chemical treatment by blending fly ash, lime or Portland

[3] Hillier, Donald E.; and Hutchinson, E. Carter, 1980, ***Depth to Water Table (1976-1977) in the Colorado Springs – Castle Rock Area, Front Range Urban Corridor, Colorado***, United States Geological Survey, Map I-857-H.

cement into the subgrade could also be considered. ***The actual mitigation methods used should be based on observation of exposed conditions by the geotechnical engineer.***

- **Subgrade Preparation:** All subgrade soils at the base of new fill, exterior PCC flatwork, and pavements should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted as discussed below just prior to construction of these elements.

- **Fill Placement and Compaction:** Clean on-site soils or approved imported materials may be used as fill material. We should be contacted to evaluate samples of any proposed fill materials prior to importation. Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Engineered fills should be placed and compacted according to the recommendations in the following table:

Criteria	Recommended values
Lift thickness	8 inches or less in loose thickness, depending on equipment
Moisture content range	Clayey soils: Optimum to +2% percent above optimum Non-plastic sands/ABC: -2% percent below to +2% percent above optimum
Compaction	Clayey soils: 95 percent minimum standard Proctor dry density (AASHTO T99) Non-plastic sands/ABC: 95 percent minimum modified Proctor dry density (AASHTO T180)

Observation and compaction testing should be performed by CGG during subgrade preparation, backfill and other earthwork operations. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

- **Excavations:** ***Caving sand soils are present at the site***. In our opinion, these sand soils should be considered as Type C when applying OSHA excavation standards. Excavations into Type C soils should be sloped at 1-½:1 (horizontal to vertical), unless the contractor's OSHA-competent person on the site determines the soil type will allow for steeper slopes. ***All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as needed to maintain stability of both the excavation sides and bottom.***

  As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

- **Site Grading:** The site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath proposed structures. It is recommended that all permanent cut and fill slopes in soil materials be made no steeper than 3 horizontal (H) to 1 vertical (V). It is recommended that all exposed earth slopes be seeded to provide protection against erosion. Seeded slopes should be protected with erosion mats until the vegetation is established. Heavy irrigation on or above slopes can cause slope instability.

Private Pavement Thickness Design and Construction: We understand that proposed pavements for the project will include concrete surfaced site entrance lanes. The remainder of the lots will not include any concrete or asphalt pavement. We have provided recommendations below for these private pavement areas based on assumed traffic levels. Any public improvements will need to conform to current requirements of the governing agency.

Design of private pavements for the project is based on the procedures outlined in the 1993 *Guideline for Design of Pavement Structures* by the American Association of State Highway and Transportation Officials (AASHTO) and the Colorado Department of Transportation (CDOT).

The referenced design methods are based on the subgrade soil support properties and anticipated traffic values.

- **Subgrade Soil:** The near-surface materials at the site consist of silty sands and are considered to provide for good pavement support. Based on the properties of the sands, we estimated a modulus of subgrade reaction (K-value) of 100 pounds per cubic inch (pci) for use in design of rigid concrete pavements.

- **Assumed Traffic Conditions:** The following traffic criteria were assumed by our office based on our experience with similar projects. ***The owner and other design professionals should review these assumptions to be sure that the pavement sections will be sufficient for anticipated traffic over the life of the project.*** Based on typical agency standards, a design life of 20 years was used for site pavements. The following assumptions were used:

    - Site entrance drives – up to 20 trips/day by single-axle delivery trucks, up to 10 trips/day by semi-tractor trailers (empty), occasional fire truck traffic (85,000 pounds maximum), weekly trash truck traffic, plus maximum daily traffic of 200 cars per day (219,000 ESAL's).

- **Pavement Sections:** For rigid pavement design, a terminal serviceability index of 2.0 was utilized along with an inherent reliability of 80 percent and a design life of 20 years. Using the design K-value, the appropriate ESAL values, environmental criteria and other factors, the structural number (SN) of the pavement section was determined on the basis of the 1993 AASHTO design equation.

  A rigid pavement design analysis was completed based upon AASHTO design procedures. Rigid pavement design is based on an evaluation of the Modulus of Subgrade Reaction of the soils (K-value), the Modulus of Rupture of the concrete, and other factors previously outlined. The design K-value for the subgrade soil was determined by correlation to the laboratory test results. A modulus of rupture of 650 psi (working stress 488 psi) was used for pavement concrete. The rigid pavement thickness was determined on the basis of the AASHTO design equation.

  The recommended rigid pavement section for the traffic area is provided below:

Private Pavement Traffic Area	Recommended Pavement Thickness (Inches)
	Portland Cement Concrete (PCC)
Heavy-Duty Site Access, Fire Lanes, Trash Truck access, Private Drives	6

- **Subgrade Preparation:** We recommend the pavement areas be rough graded and then thoroughly proof rolled with a loaded tandem axle dump truck, water truck, or other heavy equipment approved by the observing engineer prior to final grading and paving. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted engineered fills.

  At a minimum, in order to provide a more uniform subgrade for site pavements, we recommend that all pavements be constructed on a minimum of 12 inches of properly moisture conditioned and recompacted on-site soils. Confirmation of the moisture content and compaction level of the subgrade soils should be confirmed within 24 hours prior to paving.

- **Temporary Unpaved Access Drives:** In our opinion, the use of aggregate base course or crushed stone may be considered for use in constructing temporary access roads for construction traffic and/or all-weather fire truck access. In order to provide an all-weather surface and considering the silty sand soils present at the site, we recommend that the section include a minimum of 8 inches of aggregate base course (CDOT Class 5 or 6) or a minimum of 6 inches of 3-inch minus crushed aggregate (or recycled concrete). In our opinion, these sections would be suitable for the support of delivery and concrete trucks and occasional fire truck access (85,000 pounds maximum)

for the anticipated duration of a typical project of this magnitude. The contractor should be responsible for monitoring the condition of unpaved drive lanes, including the repair and maintenance of the drive lanes throughout their use to provide the required access. We believe it is likely that these aggregate materials will be "contaminated" with soil and other constituents over the course of construction; therefore, the aggregate materials should not be considered part of the final pavement section unless otherwise evaluated and approved by the Geotechnical Engineer.

- **Pavement Materials:** Materials and construction of pavements for the project should be in general accordance with Colorado Department of Transportation (CDOT) specifications.

  Where rigid pavements are used, the concrete should be obtained from an approved mix design with the following minimum properties:

  - Modulus of Rupture @ 28 days .....650 psi minimum
  - Strength Requirements..... ASTM C94
  - Cement Type..... Type II Portland
  - Entrained Air Content .....6 to 8%
  - Concrete Aggregate .....ASTM C33 and CDOT Section 703

  Concrete should be deposited by truck mixers or agitators and placed a maximum of 90 minutes from the time the water is added to the mix. Other specifications outlined by CDOT should be followed.

  Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of joints should be based upon the final pavement geometry. Sawed joints should be cut within 24 hours of concrete placement and should be a minimum of 25 percent of slab thickness plus 1/4 inch. All joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer.

- **Concrete Corrosion Protection:** Select soil samples likely to be in contact with project concrete were tested for the presence of water-soluble sulfates in order to determine corrosion characteristics and the appropriate concrete mixtures. Results of testing indicate a negligible water soluble-sulfate concentration.

  Project concrete should meet CDOT Class P requirements as discussed in the Pavement Materials section above. Results of testing indicate the site soils are within CDOT Sulfate Exposure Class 0 as outlined in Section 601 of the CDOT *Standard Specifications for Road and Bridge Construction (2017)* manual. ***However, for increased protection form concrete sulfate attack, we recommend***

project concrete be designed in accordance with CDOT Sulfate Exposure Class 1, as summarized in the table below.

CDOT Sulfate Exposure Class	Portland Cement Type (ASTM C150)	Maximum Water/Cement Ratio	Minimum Concrete Compressive Strength (psi)
1	II (or equivalent)	0.44*	4,500

* Maximum water/cement ratio allowed for CDOT Class P concrete.

- **Compliance:** Recommendations for pavement design and construction presented depend upon compliance with recommended material specifications. To assess compliance, observation and testing should be performed under the observation of the geotechnical engineer.

- **Pavement Performance and Maintenance:** Future performance of pavements constructed on the subgrade at this site will be dependent upon several factors, including:

  - Maintaining stable moisture content of the subgrade soils.
  - Providing for a planned program of preventative maintenance.

  The performance of all pavements can be enhanced by minimizing excess moisture, which can reach the subgrade soils. The following recommendations should be considered at minimum:

  - Site grading at a minimum 2 percent grade onto or away from pavements.
  - Water should not be allowed to pond behind curbs.
  - Compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade.
  - Sealing all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils.
  - Placing compacted backfill against the exterior side of curb and gutter.
  - Placing curb, gutter and/or sidewalk directly on subgrade soils without the use of base course materials.

  Preventative maintenance should be planned and provided for an ongoing pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment.

  Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first

priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Stormwater Management Improvements: Subsurface conditions in our borings (L1-DP and L2-DP) performed in the area of the proposed stormwater detention basins included silty sand and fine to coarse grained sands. Field infiltration testing (cased borehole) was performed in test holes (L1-IF1 through IF3 and L2-IF1 through IF3) drilled within the proposed stormwater basin at an approximate depth of 5 feet below existing site grades. Results of infiltration testing are attached. Infiltration testing was performed in general accordance with local Standards.

Design of stormwater related improvements should follow applicable El Paso County standards and the Mile High Flood District (MHFD) *Drainage Criteria Manual*. The data presented herein is provided for use by the project Civil Engineer for design of these features. We are available to discuss our results, upon request.

We appreciate being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. Please do not hesitate to contact us if you have any questions concerning this report or any of our testing, inspection, design and consulting services.

Sincerely,

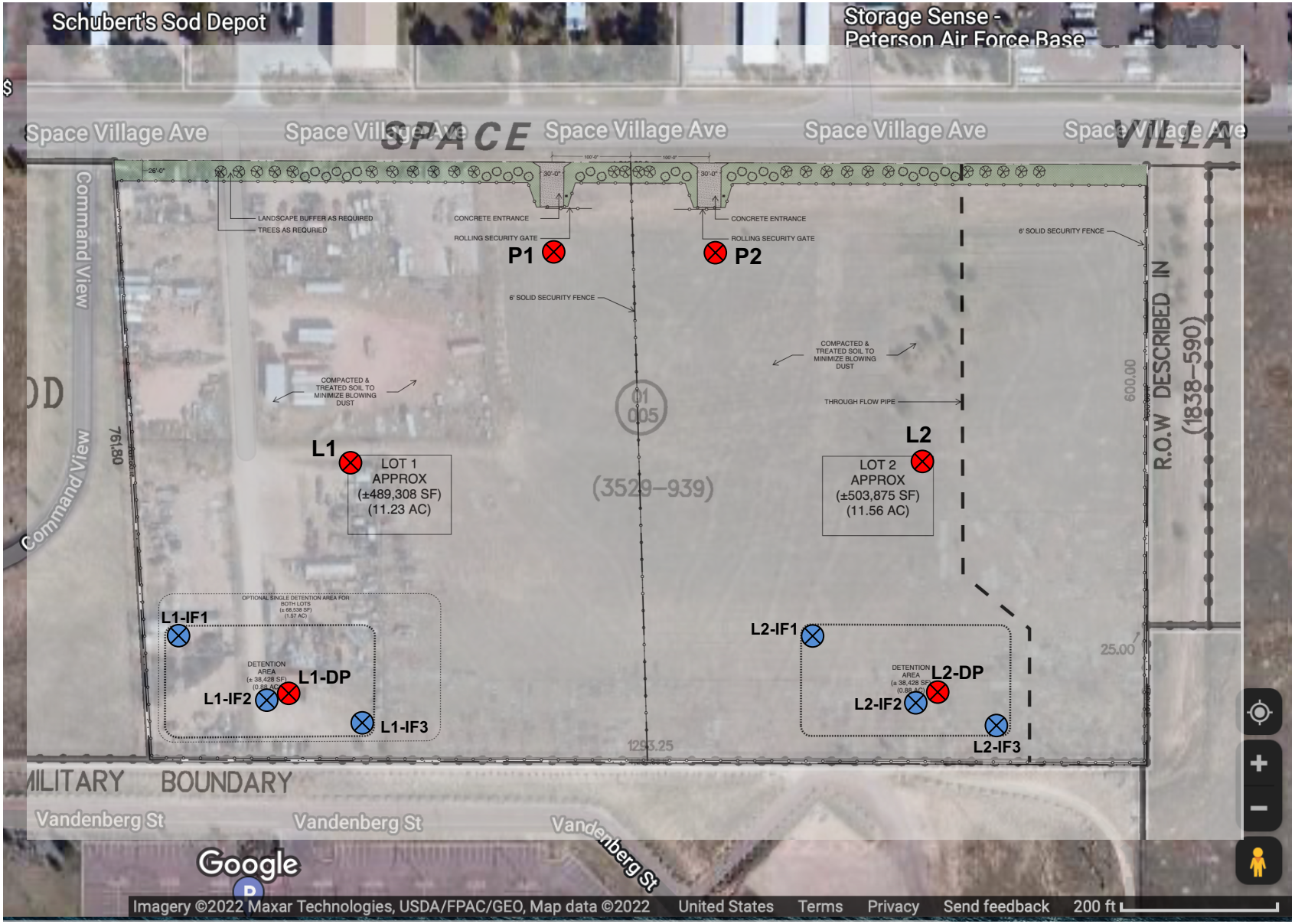
Cole Garner Geotechnical

Glenn D. Ohlsen, P.E.
Project Engineer

Andrew J. Garner, P.E.
Principal, COO

Copies to: Addressee (1 PDF copy)

Attachments: Boring Location Diagram, Boring Logs, Laboratory Tests Results,
Field Infiltration Tests Results, General Notes



APPROXIMATE BORING LOCATIONS

APPROXIMATE INFILTRATION TEST HOLE LOCATIONS

FIGURE 1 - BORING LOCATION DIAGRAM
PROPOSED STORAGE YARDS
0 SPACE VILLAGE AVENUE
EL PASO COUNTY, COLORADO
CGG PROJECT NO. 22.22.155

Cole Garner Geotechnical
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(303) 996-2999

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L1

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
DURING DRILLING None
LOGGED BY AS **CHECKED BY** AG
AFTER DRILLING None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, varies clayey, tan, light brown, dry to moist, loose to medium dense	0							
			SM	CB	100	6 / 12	5.4	108	
		5	SM	CB	100	6 / 12	5.5	107	
		10	SW-SM	CB	100	8 / 12	5.6	103	
		15	SM	CB	100	33 / 12	4.9	115	
		20	SM	CB	100	42 / 12	7.6	116	
		25	SM	CB	100	37 / 12	4.6	111	
		30	SM	CB	100	43 / 12	5.2	122	
	35	35	SM	CB	100	23 / 12	22.3	105	

Approximate bottom of borehole at 35.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L1-DP

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** DCI 6' - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, varies clayey, light brown to brown, dry to moist, very loose to medium dense	0							
			SM	CB	100	5 / 12	4.5	105	
		5	SM	CB	100	7 / 12	96.3	108	
		10	SP-SM	CB	100	30 / 12	6.9	120	
		15	SM	CB	100	19 / 12	9.0	123	
		20	SM	CB	100	33 / 12	7.7	119	
	20								

Approximate bottom of borehole at 20.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L1-IF1

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
DURING DRILLING None
LOGGED BY AS **CHECKED BY** AG
AFTER DRILLING None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, light brown, dry to moist, loose	0							
			SM	CB	100	7 / 12	7.5	108	
		5	SM	CB	100	6 / 12	6.0	105	

Approximate bottom of borehole at 5.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L1-IF2

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, brown, dry to moist, loose to medium dense	0							
			SM	CB	100	16 / 12	8.7	117	
	5	5	SM	CB	100	8 / 12	6.1	109	

Approximate bottom of borehole at 5.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L1-IF3

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, brown, dry to moist, very loose to loose	0							
			SM	CB	100	5 / 12	4.9	108	
		5	SM	CB	100	6 / 12	3.9	107	

Approximate bottom of borehole at 5.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L2

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** 16.00 ft
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** DCI 9' - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, varies clayey, tan, light brown, dry to wet, loose to medium dense	0							
			SM	CB	100	7 / 12	7.6	110	
		5	SM	CB	100	11 / 12	2.3	104	
		10	SM	CB	100	11 / 12	4.5	111	
	▽	15	SM	CB	100	25 / 12	10.4	118	
		20	SM	CB	100	39 / 12	9.3	123	
		25	SM	CB	100	43 / 12	2.4	133	
	25								

Approximate bottom of borehole at 25.0 feet.

Cole Garner Geotechnical
1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L2-DP

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, light brown to brown, dry to moist, very loose to medium dense	0							
			SM	CB	100	5 / 12	9.8	109	
		5	SM	CB	100	5 / 12	5.6	104	
		10	SM	CB	100	8 / 12	4.1	106	
		15	SM	CB	100	24 / 12	5.2	116	
		20	SM	CB	100	33 / 12	8.0	127	
	20								

Approximate bottom of borehole at 20.0 feet.

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1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L2-IF1

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, light brown, dry to moist, very loose to loose	0							
			SM	CB	100	5 / 12	7.0	108	
		5	SM	CB	100	6 / 12	6.7	109	

Approximate bottom of borehole at 5.0 feet.

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1070 W 124th Ave, Suite 300
Westminster, CO 80234

BORING NUMBER L2-IF2

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, brown, dry to moist, loose	0							
			SM	CB	100	6 / 12	9.1	111	
		5	SM	CB	100	6 / 12	9.0	108	

Approximate bottom of borehole at 5.0 feet.

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BORING NUMBER L2-IF3

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
DURING DRILLING None
LOGGED BY AS **CHECKED BY** AG
AFTER DRILLING None - 8/8/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to coarse-grained, brown, dry to moist, loose	0							
			SM	CB	100	6 / 12	7.7	109	
		5	SM	CB	100	6 / 12	6.1	107	

Approximate bottom of borehole at 5.0 feet.

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BORING NUMBER P1

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** Backfilled - 7/29/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to medium-grained, tan, dry to moist, loose	0							
			SM	CB	100	9 / 12	2.4	102	
		5	SM	CB	100	8 / 12	3.6	107	
	Approximate bottom of borehole at 5.0 feet.								

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BORING NUMBER P2

CLIENT Commercial Building Services
PROJECT NAME Proposed Storage Yards
PROJECT NUMBER 22.22.155
PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO
DATE STARTED 7/29/22 **COMPLETED** 7/29/22
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR GDI Drilling Inc
SURFACE CONDITIONS Low growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** None
LOGGED BY AS **CHECKED BY** AG
▼ **AFTER DRILLING** Backfilled - 7/29/22

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, fine- to medium-grained, tan, dry to moist, loose to medium dense	0							
			SM	CB	100	16 / 12	2.0	101	
	5	5	SM	CB	100	9 / 12	2.4	101	

Approximate bottom of borehole at 5.0 feet.

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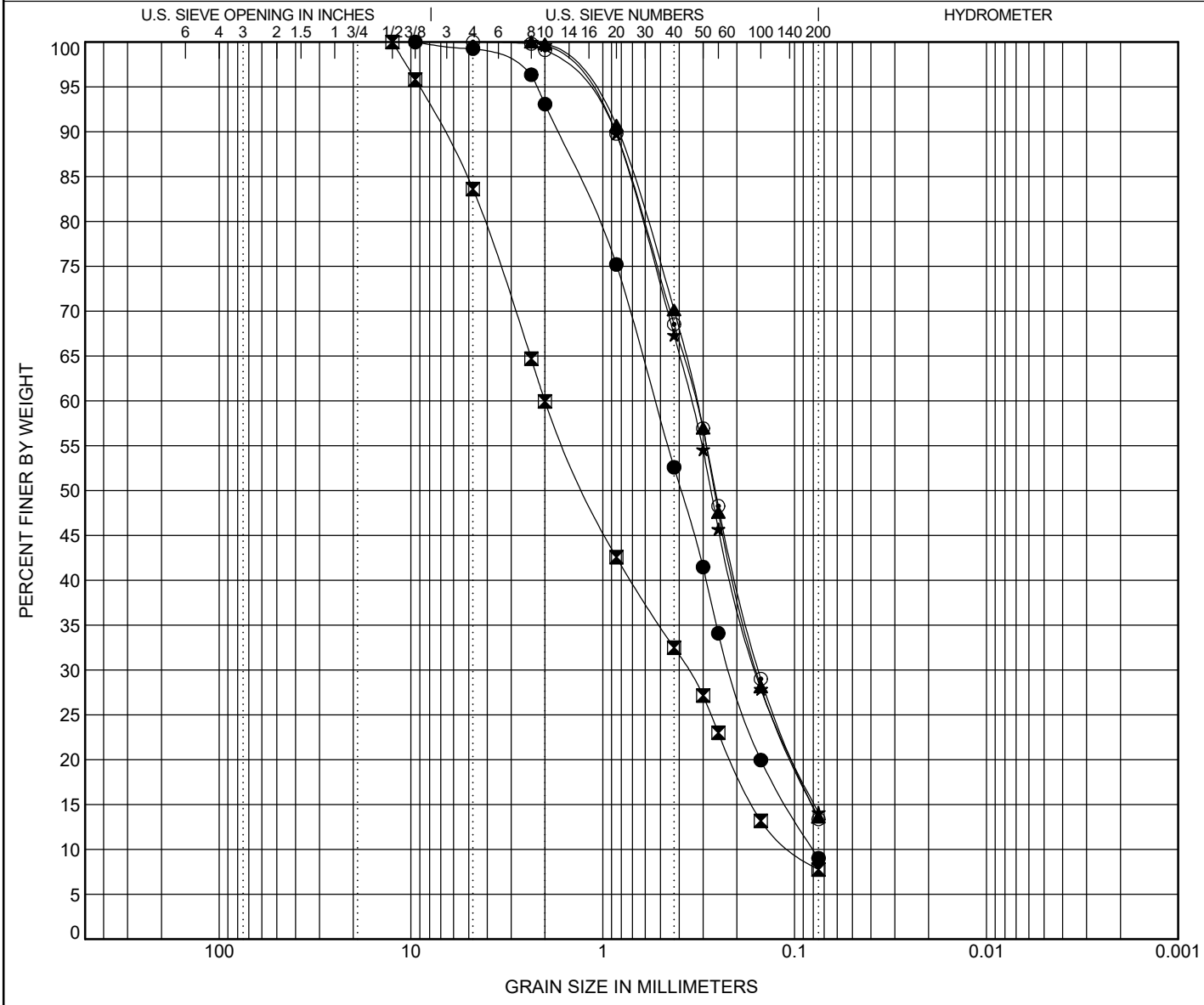
Telephone: 3039962999

GRAIN SIZE DISTRIBUTION

CLIENT Commercial Building Services **PROJECT NAME** Proposed Storage Yards

PROJECT NUMBER 22.22.155 **PROJECT LOCATION** 0 Space Village Avenue - El Paso County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	L1	9.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.09	6.68
⊠	L1-DP	9.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.65	20.08
▲	L2	4.0	SILTY SAND(SM)	NP	NP	NP		
★	L2-DP	4.0	SILTY SAND(SM)	NP	NP	NP		
⊙	P1	2.0	SILTY SAND(SM)	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	L1	9.0	9.5	0.533	0.216	0.08	0.7	90.2	9.0	
⊠	L1-DP	9.0	12.5	2.004	0.361	0.1	16.4	75.8	7.8	
▲	L2	4.0	2.36	0.325	0.158		0.0	86.4	13.6	
★	L2-DP	4.0	2.36	0.348	0.159		0.0	85.9	14.1	
⊙	P1	2.0	4.75	0.329	0.154		0.0	86.6	13.4	

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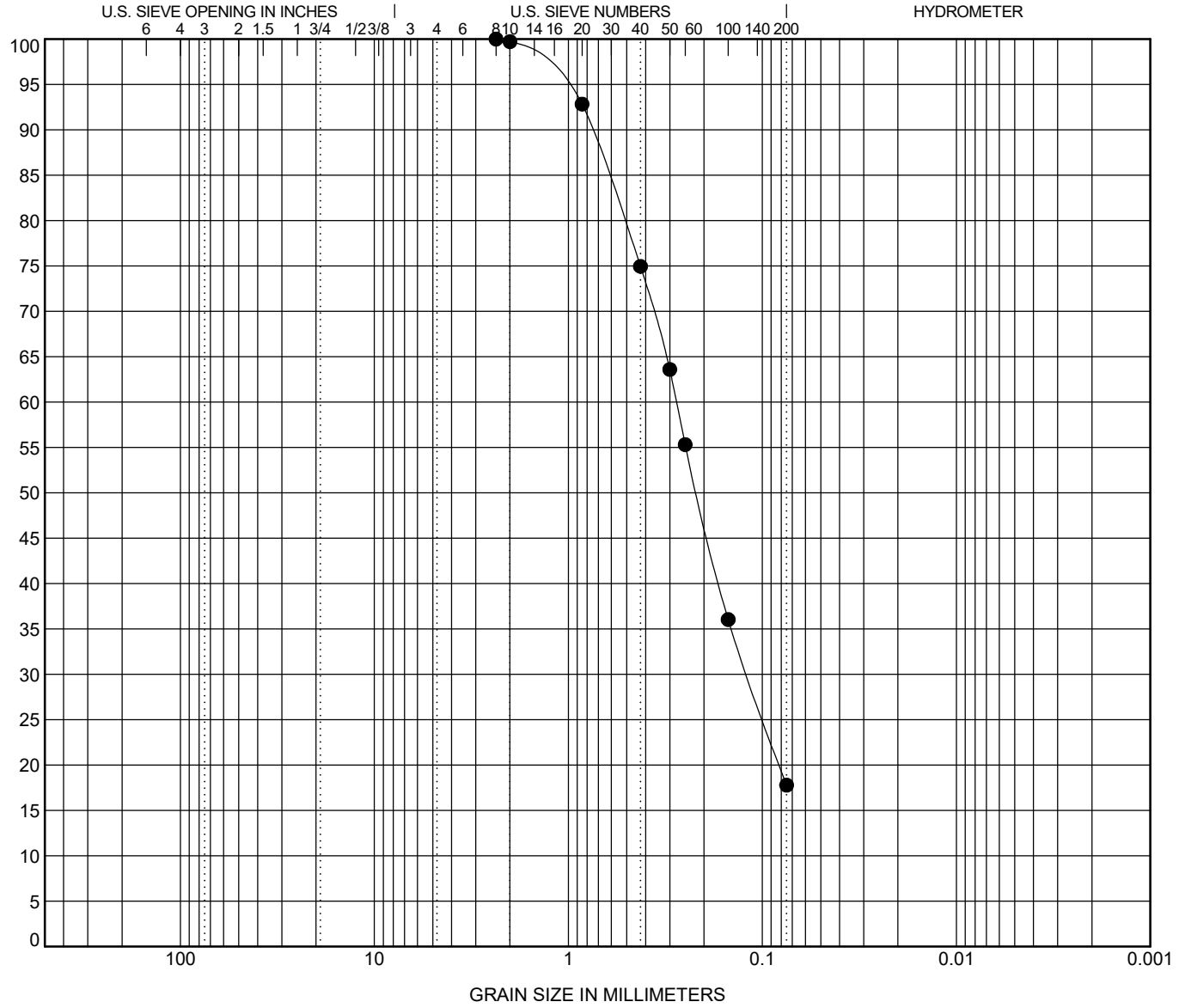
GRAIN SIZE DISTRIBUTION

CLIENT Commercial Building Services **PROJECT NAME** Proposed Storage Yards

PROJECT NUMBER 22.22.155 **PROJECT LOCATION** 0 Space Village Avenue - El Paso County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● P2	2.0	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● P2	2.0	**2.36**	**0.277**	**0.119**		**0.0**	**82.2**	**17.8**	

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SUMMARY OF LABORATORY RESULTS

CLIENT Commercial Building Services

PROJECT NAME Proposed Storage Yards

PROJECT NUMBER 22.22.155

PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO

Borehole	Depth	Soil Description	Water Content (%)	Dry Density (pcf)	Swell (+) or Consolidation (-)/ Surcharge (%/psf)	Water Soluble Sulfates (ppm)	Passing #200 Sieve (%)	Atterberg Limits		
								Liquid Limit	Plastic Limit	Plasticity Index
L1	2	SILTY SAND	5.4	108.3						
L1	4	SILTY SAND	5.5	107.2						
L1	9	FINE to COARSE SAND with SILT	5.6	103.5			9	NP	NP	NP
L1	14	SILTY SAND	4.9	115.0						
L1	19	SILTY SAND	7.6	116.5						
L1	24	SILTY SAND	4.6	110.8						
L1	29	SILTY SAND	5.2	122.2						
L1	34	SILTY SAND	22.3	104.5						
L1-DP	2	SILTY SAND	4.5	105.0						
L1-DP	4	SILTY SAND	96.3	107.7						
L1-DP	9	FINE to COARSE SAND with SILT	6.9	120.2			8	NP	NP	NP
L1-DP	14	SILTY SAND	9.0	123.1						
L1-DP	19	SILTY SAND	7.7	118.8						
L1-IF1	2	SILTY SAND	7.5	108.4						
L1-IF1	4	SILTY SAND	6.0	104.6						
L1-IF2	2	SILTY SAND	8.7	116.5						
L1-IF2	4	SILTY SAND	6.1	108.8						
L1-IF3	2	SILTY SAND	4.9	108.0						
L1-IF3	4	SILTY SAND	3.9	107.0						
L2	2	SILTY SAND	7.6	109.8						
L2	4	SILTY SAND(SM)	2.3	104.1		0	14	NP	NP	NP
L2	9	SILTY SAND	4.5	111.4						
L2	14	SILTY SAND	10.4	118.0						
L2	19	SILTY SAND	9.3	123.4						
L2	24	SILTY SAND	2.4	132.7						
L2-DP	2	SILTY SAND	9.8	108.7						
L2-DP	4	SILTY SAND(SM)	5.6	103.9			14	NP	NP	NP
L2-DP	9	SILTY SAND	4.1	105.5						
L2-DP	14	SILTY SAND	5.2	115.9						
L2-DP	19	SILTY SAND	8.0	126.8						

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SUMMARY OF LABORATORY RESULTS

CLIENT Commercial Building Services

PROJECT NAME Proposed Storage Yards

PROJECT NUMBER 22.22.155

PROJECT LOCATION 0 Space Village Avenue - El Paso County, CO

Borehole	Depth	Soil Description	Water Content (%)	Dry Density (pcf)	Swell (+) or Consolidation (-)/ Surcharge (%/psf)	Water Soluble Sulfates (ppm)	Passing #200 Sieve (%)	Atterberg Limits		
								Liquid Limit	Plastic Limit	Plasticity Index
L2-IF1	2	SILTY SAND	7.0	108.4						
L2-IF1	4	SILTY SAND	6.7	109.5						
L2-IF2	2	SILTY SAND	9.1	111.3						
L2-IF2	4	SILTY SAND	9.0	108.5						
L2-IF3	2	SILTY SAND	7.7	109.2						
L2-IF3	4	SILTY SAND	6.1	107.3						
P1	2	SILTY SAND(SM)	2.4	101.7			13	NP	NP	NP
P1	4	SILTY SAND	3.6	106.9						
P2	2	SILTY SAND(SM)	2.0	101.4		0	18	NP	NP	NP
P2	4	SILTY SAND	2.4	101.0						

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1070 West 124th Avenue, Ste. 300
Westminster, CO 80234
(303) 996-2999

Field Infiltration Rate Test No. L1-IF1

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	2 13/16	5.33	11.25
17:05	17:20	15	2 1/4	6.67	9.00
17:20	17:35	15	2	7.50	8.00
17:35	17:50	15	1 3/8	10.91	5.50
17:50	18:05	15	7/8	17.14	3.50
18:05	18:20	15	5/8	24.00	2.50
18:20	18:35	15	11/16	21.82	2.75
18:35	18:50	15	5/8	24.00	2.50

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**2.50**
Average Infiltration Rate:	**7.45**

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(303) 996-2999

Field Infiltration Rate Test No. L1-IF2

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	2 1/8	7.06	8.50
17:05	17:20	15	2	7.50	8.00
17:20	17:35	15	2 5/16	6.49	9.25
17:35	17:50	15	1 3/4	8.57	7.00
17:50	18:05	15	1 1/2	10.00	6.00
18:05	18:20	15	1 1/4	12.00	5.00
18:20	18:35	15	1 3/8	10.91	5.50
18:35	18:50	15	1 1/8	13.33	4.50

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**4.50**
Average Infiltration Rate:	**7.75**

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Westminster, CO 80234
(303) 996-2999

Field Infiltration Rate Test No. L1-IF3

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	6 11/16	2.24	26.75
17:05	17:20	15	5 11/16	2.64	22.75
17:20	17:35	15	5 5/16	2.82	21.25
17:35	17:50	15	4 3/16	3.58	16.75
17:50	18:05	15	3	5.00	12.00
18:05	18:20	15	3 11/16	4.07	14.75
18:20	18:35	15	1 3/8	10.91	5.50
18:35	18:50	15	2 3/8	6.32	9.50

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**9.50**
Average Infiltration Rate:	**19.90**

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Westminster, CO 80234
(303) 996-2999

Field Infiltration Rate Test No. L2-IF1

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	2 3/8	6.32	9.50
17:05	17:20	15	1 15/16	7.74	7.75
17:20	17:35	15	2	7.50	8.00
17:35	17:50	15	1 15/16	7.74	7.75
17:50	18:05	15	1 13/16	8.28	7.25
18:05	18:20	15	1 3/8	10.91	5.50
18:20	18:35	15	1 7/16	10.43	5.75
18:35	18:50	15	1 1/2	10.00	6.00

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**6.00**
Average Infiltration Rate:	**8.05**

Cole Garner Geotechnical
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Westminster, CO 80234
(303) 996-2999

Field Infiltration Rate Test No. L2-IF2

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	1 1/4	12.00	5.00
17:05	17:20	15	7/8	17.14	3.50
17:20	17:35	15	1	15.00	4.00
17:35	17:50	15	1	15.00	4.00
17:50	18:05	15	7/8	17.14	3.50
18:05	18:20	15	3/4	20.00	3.00
18:20	18:35	15	3/4	20.00	3.00
18:35	18:50	15	3/4	20.00	3.00

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**3.00**
Average Infiltration Rate:	**4.00**

Cole Garner Geotechnical
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Westminster, CO 80234
(303) 996-2999

Field Infiltration Rate Test No. L2-IF3

Project Name:	0 Space Village Ave	Date:	8/8/2022
Cole Garner Project No.:	22.22.155	Hole diameter (in):	6
Eng./Tech.:	T.M.C.	Approx. Test Depth (in):	60

Interval Start Time (hh:mm)	Interval End Time (hh:mm)	Length of Interval (min)	Water Level Drop (in)	Infiltration Rate During Interval (min/in)	Infiltration Rate During Interval (in/hr)
16:50	17:05	15	2 5/8	5.71	10.50
17:05	17:20	15	1 5/8	9.23	6.50
17:20	17:35	15	1 3/4	8.57	7.00
17:35	17:50	15	15/16	16.00	3.75
17:50	18:05	15	15/16	16.00	3.75
18:05	18:20	15	9/16	26.67	2.25
18:20	18:35	15	13/16	18.46	3.25
18:35	18:50	15	9/16	26.67	2.25

REMARKS: Modified infiltrometer test (cased borehole; 4-inch solid pipe) performed in the silty sand soils at a depth of about 5 feet below existing site grade.

Final Infiltration Rate:	**2.25**
Average Infiltration Rate:	**6.30**

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1⅜" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2.5" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
CB:	California Barrel - 1.92" I.D., 2.5" O.D., unless otherwise noted	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 2.5" O.D. California Barrel samplers (CB) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per inch," and is not considered equivalent to the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling
WCI:	Wet Cave in	WD:	While Drilling
DCI:	Dry Cave in	BCR:	Before Casing Removal
AB:	After Boring	ACR:	After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

FINE-GRAINED SOILS			COARSE-GRAINED SOILS			BEDROCK		
(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency	(CB) Blows/Ft.	(SS) Blows/Ft.	Relative Density	(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency
< 3	0-2	Very Soft	0-5	< 3	Very Loose	< 24	< 20	Weathered
3-5	3-4	Soft	6-14	4-9	Loose	24-35	20-29	Firm
6-10	5-8	Medium Stiff	15-46	10-29	Medium Dense	36-60	30-49	Medium Hard
11-18	9-15	Stiff	47-79	30-50	Dense	61-96	50-79	Hard
19-36	16-30	Very Stiff	> 79	> 50	Very Dense	> 96	> 79	Very Hard
> 36	> 30	Hard						

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

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

RELATIVE PROPORTIONS OF FINES

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]		GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]		SW	Well graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line[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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

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

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

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

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

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

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

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

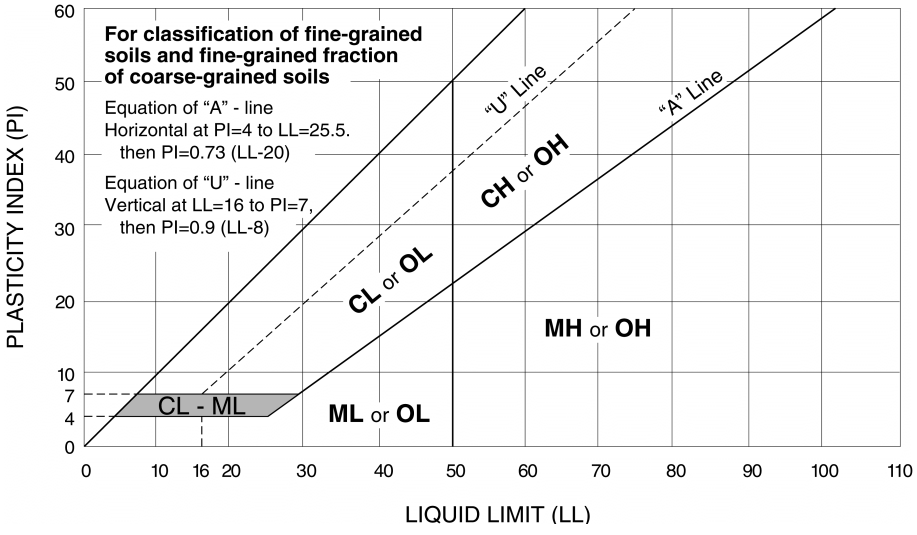
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

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

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

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

[Q] PI plots below "A" line.



LABORATORY TEST
SIGNIFICANCE AND PURPOSE

TEST	SIGNIFICANCE	PURPOSE
California Bearing Ratio	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	***Pavement Thickness Design***
Consolidation	Used to develop an estimate of both the rate and amount of both differential and total settlement of a structure.	***Foundation Design***
Direct Shear	Used to determine the consolidated drained shear strength of soil or rock.	***Bearing Capacity, Foundation Design, and Slope Stability***
Dry Density	Used to determine the in-place density of natural, inorganic, fine-grained soils.	***Index Property Soil Behavior***
Expansion	Used to measure the expansive potential of fine-grained soil and to provide a basis for swell potential classification.	***Foundation and Slab Design***
Gradation	Used for the quantitative determination of the distribution of particle sizes in soil.	***Soil Classification***
Liquid & Plastic Limit, Plasticity Index	Used as an integral part of engineering classification systems to characterize the fine-grained fraction of soils, and to specify the fine-grained fraction of construction materials.	***Soil Classification***
Permeability	Used to determine the capacity of soil or rock to conduct a liquid or gas.	***Groundwater Flow Analysis***
pH	Used to determine the degree of acidity or alkalinity of a soil.	***Corrosion Potential***
Resistivity	Used to indicate the relative ability of a soil medium to carry electrical currents.	***Corrosion Potential***
R-Value	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	***Pavement Thickness Design***
Soluble Sulfate	Used to determine the quantitative amount of soluble sulfates within a soil mass.	***Corrosion Potential***
Unconfined Compression	To obtain the approximate compressive strength of soils that possess sufficient cohesion to permit testing in the unconfined state.	***Bearing Capacity Analysis for Foundations***
Water Content	Used to determine the quantitative amount of water in a soil mass.	***Index Property Soil Behavior***

REPORT TERMINOLOGY
(Based on ASTM D653)

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Alluvium	Soil, the constituents of which have been transported in suspension by flowing water and subsequently deposited by sedimentation.
Aggregate Base Course	A layer of specified material placed on a subgrade or subbase usually beneath slabs or pavements.
Backfill	A specified material placed and compacted in a confined area.
Bedrock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Bench	A horizontal surface in a sloped deposit.
Caisson (Drilled Pier or Shaft)	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier or drilled shaft.
Coefficient of Friction	A constant proportionality factor relating normal stress and the corresponding shear stress at which sliding starts between the two surfaces.
Colluvium	Soil, the constituents of which have been deposited chiefly by gravity such as at the foot of a slope or cliff.
Compaction	The densification of a soil by means of mechanical manipulation
Concrete Slab-on-Grade	A concrete surface layer cast directly upon a base, subbase or subgrade, and typically used as a floor system.
Differential Movement	Unequal settlement or heave between, or within foundation elements of structure.
Earth Pressure	The pressure exerted by soil on any boundary such as a foundation wall.
ESAL	Equivalent Single Axle Load, a criteria used to convert traffic to a uniform standard, (18,000 pound axle loads).
Engineered Fill	Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a geotechnical engineer.
Equivalent Fluid	A hypothetical fluid having a unit weight such that it will produce a pressure against a lateral support presumed to be equivalent to that produced by the actual soil. This simplified approach is valid only when deformation conditions are such that the pressure increases linearly with depth and the wall friction is neglected.
Existing Fill (or Man-Made Fill)	Materials deposited throughout the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.

REPORT TERMINOLOGY
(Based on ASTM D653)

Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Finished Grade	The final grade created as a part of the project.
Footing	A portion of the foundation of a structure that transmits loads directly to the soil.
Foundation	The lower part of a structure that transmits the loads to the soil or bedrock.
Frost Depth	The depth at which the ground becomes frozen during the winter season.
Grade Beam	A foundation element or wall, typically constructed of reinforced concrete, used to span between other foundation elements such as drilled piers.
Groundwater	Subsurface water found in the zone of saturation of soils or within fractures in bedrock.
Heave	Upward movement.
Lithologic	The characteristics which describe the composition and texture of soil and rock by observation.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil, sometimes referred to as natural soil.
Optimum Moisture Content	The water content at which a soil can be compacted to a maximum dry unit weight by a given compactive effort.
Perched Water	Groundwater, usually of limited area maintained above a normal water elevation by the presence of an intervening relatively impervious continuous stratum.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Skin Friction (Side Shear)	The frictional resistance developed between soil and an element of the structure such as a drilled pier.
Soil (Earth)	Sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.
Strain	The change in length per unit of length in a given direction.
Stress	The force per unit area acting within a soil mass.
Strip	To remove from present location.
Subbase	A layer of specified material in a pavement system between the subgrade and base course.
Subgrade	The soil prepared and compacted to support a structure, slab or pavement system.