AMERICAN GEOSERVICES

Geotechnical Evaluation Report

16910 Thompson Rd, Colorado Springs, CO 80908

Date: March 28, 2021; Project No: 0140-CS21

March 28, 2021

PROJECT NO: 0140-CS21

CLIENT: Mr. Les Gruen

Re: Geotechnical Evaluation and Geologic Hazards Evaluation Report, 16910 Thompson Rd, Colorado Springs, CO

Dear Mr. Gruen,

At your request, we have completed the above referenced services for the referenced project in accordance with the American GeoServices, LLC (AGS) proposal and your authorization-to-proceed. Results of our evaluation and design recommendations are described below.

PROJECT INFORMATION

The site is located as shown in Figure 1 and Figure 2. The site is a partially developed lot and gently sloping land in a residential/rural neighborhood. The subject property is an 8-acre rectangular site located just north of Hodgen Road and about 2 miles east of Hwy. 83. The tax schedule number is 51190-00-007.

We understand the property was purchased just over one year ago. It was formerly a diary and had become pretty run down over the years. The new owner is in the process of renovating existing buildings on the property which include an old house, a guest house and several out buildings. An event center/wedding venue has been envisioned that could accommodate up to 100 guests plus 20-25 ancillary vendors such as, caterers, band members, hair dressers, etc. There is not expected to be any on-site food preparation. No new construction on the property is anticipated other than crushed asphalt parking to accommodate approximately 60 vehicles.

However, in future, the proposed development may consist of building residential structures. We do not anticipate significant site grading (fill placement) for this project. We anticipate proposed structures will be constructed with low to moderate foundation loads. If these proposed conditions change, we should be contacted to modify our report.

SCOPE OF WORK

In February 2021, six soil explorations were performed by us at locations B1-B6 as shown in Figure 2. This exploration included soil auguring, soil sampling, and Standard Penetration Testing (SPT) equivalent testing. Explorations extended to a maximum depth of 12 feet below the existing ground surface where high (50+) SPT equivalent blow counts were encountered. In addition, we also reviewed available water well logs which contained a subsurface profile extending to several tens of feet. Additional subsurface exploration was not deemed necessary at this time.

All soil samples were identified in the field and were placed in sealed containers and transported to the laboratory for further testing and classification. Logs of all soil explorations showing details of subsurface soil conditions encountered at the site are included in an appendix. The SPT tests, when properly evaluated, provide an index to the soil strength and density of the material tested. The penetration test results are shown on the individual Exploration Log included in an Appendix. The Legend and Notes necessary to interpret our Exploration Logs are also included in an appendix.

Data obtained from site observations, subsurface exploration, laboratory evaluation, and previous experience in the area was used to perform engineering analyses. Results of engineering analyses were then used to reach conclusions and recommendations presented in this report.

The subsurface exploration results are shown on the individual Boring Logs included in an Appendix. The Legend and Notes necessary to interpret our Boring Logs are also included in an appendix.

SUBSURFACE CONDITIONS

Soil classification and identification is based on commonly accepted methods employed in the practice of geotechnical engineering. In some cases, the stratigraphic boundaries shown on Boring Logs represents transitions between soil types rather than distinct lithological boundaries. It should be recognized that subsurface conditions often vary both with depth and laterally between individual boring locations. The following is a summary of the subsurface conditions encountered at the site:

Topsoil: Gravelly sand with organics is present in upper up to 6 inches throughout the site.

Native Alluvium / Residuum: Site was generally underlain by generally medium dense to dense mixtures of clay, silt, gravel, and sands (SM, GP/GM/GC) extending to a depth of about 7.0-10.0

feet below ground surface (BGS). These soils appeared to have been derived from complete weathering of local Dawson Arkose.

Dawson Arkose: Below 7.0-10.0 feet, site is underlain by generally dense mixtures of sands, clays, and gravels, which extended to the maximum explored depth. These soils appeared to have been derived from complete weathering of local clayey sandstone bedrock, known as Dawson Arkose.

Groundwater: Perched groundwater was not encountered during explorations throughout the site. In our opinion, perched groundwater conditions may exist at depths of about 8-10 feet below existing ground surface during heavy rains, throughout the site. This observation may not be indicative of other times or at locations other than the site. Some variations in the groundwater level may be experienced in the future. The magnitude of the variation will largely depend upon the duration and intensity of precipitation, temperature and the surface and subsurface drainage characteristics of the surrounding area.

GEOLOGIC HAZARDS

Landslides: Our review of available geologic maps and landslide hazard maps indicated that landslides had not occurred at the site or in the site vicinity area, and the site area is not susceptible to landslides. During our site reconnaissance and in the available geologic and geologic hazards maps, landslide features were not mapped within the site boundary area. The site and the vicinity area are not close to the zone designated as having landslide potential. Our site reconnaissance did not reveal any significant potential for slope failures, shallow slumps, or existing severe erosion at the site. At present, there are no visual signs of slope failures such as tension cracks, several bent trees, unusual drainage patterns and vegetation, leaning retaining walls, or significant settlements or movements in any existing structures. Considering the site geology and the absence of mapped landslides in the site vicinity, in our opinion, there is a very low potential for future landslides at the site.

Slope Stability: Using the results of subsurface exploration, laboratory evaluation, and site reconnaissance data, we analyzed on-site slopes by performing preliminary slope stability analyses. We used the software SLOPE/W to model on-site slopes, subsurface soil conditions, and the impact of proposed construction on the stability of the site. Based on the results of our preliminary evaluation, we make following recommendations.

- There is a very low potential for shallow slumps or slope failures provided proper geotechnical design and well-monitored construction activities are used to develop the site. Provided proper geotechnical design is done, and all geotechnical recommendations are strictly followed, the site will remain stable after proposed construction. Although the potential is low, minor localized and shallow slumps may occur in areas steeper than 2.0H(Horizontal):1V(Vertical); however, their occurrence will not impact the stability of the proposed structures provided they are properly located and designed in accordance with geotechnical recommendations given by the geotechnical engineer.

- Storm water disposal regulations of local Counties and Cities, and general drainage recommendations given in following sections should be strictly followed.
- In general, areas with moderate to steep slopes present greater construction difficulties. These areas can easily become unstable as the result of poorly planned or non-engineered construction activities such as cuts and fill. Therefore, these areas should not be considered for development or disturbed without a detailed review of site grading plans and house plans by the project geotechnical engineer, and slope stability analysis and foundation design as required once the site grading plans and house plans are completed.

Earthquakes: Based on site geology, topography, and our preliminary evaluation, in our opinion, the site is generally not considered to be located within highly active seismic area. Therefore, anticipated ground motions in the region due to seismic activity are relatively low and do not pose a significant hazard. Ground accelerations more than 0.1g to -0.2g are not anticipated to occur at the site.

Based on the results of our subsurface explorations and review of available literature (Current international Building Code), in our opinion, a site classification “C” may be used for this project. However, this site classification may be revised by performing a site-specific shear wave velocity study.

Subsurface soil conditions at the site are not susceptible to liquefaction. Seismically induced slope instability may occur on a localized scale in the steep slope areas; however, such an evaluation was beyond our scope of services. A detailed seismic hazards evaluation of the site was beyond our scope of services

Expansive Soils and Bedrock: The site is not underlain by highly expansive clayey soils or clayey sedimentary bedrock materials, however, it is possible to encounter low to moderate expansive soils at depths (Figure 5). If expansive soil pockets are encountered, mitigation of expansive soils will require over-excavation and replacement with non-expansive soils placed and compacted at a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698. Over-excavation and replacement has been successful in minimizing slab movements. Final recommendations should be determined after an open-hole inspection is performed by AGS during construction.

Collapsible Soils: The site is not underlain by loess or wind-blown deposit near the surface which are collapsible soils. In any case, if collapsible soil pockets are encountered, they will require surficial densification or over-excavation and replacement with non-collapsible soils placed and compacted a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698. As an option, the use of drilled pier foundation may be considered. Final recommendations should be determined after an open-hole inspection is performed by AGS during construction.

Man-made soils or Artificial Fill: These consist of man-made fill deposits associated with erosion berms and earthen dams. These areas were not present at the time of site reconnaissance.

Seasonal & Potentially Seasonal Shallow Groundwater Areas: These areas have periodically high subsurface moisture conditions and frost-heave potential. In general, these areas lie within the drainages and low-lying areas. These areas are not present at the site. The site is not located within any mapped floodplain zones according to the FEMA Maps. A detailed flood hazard evaluation, or the determination of exact locations of floodplain and specific drainage studies were beyond our scope of services. In any case, as a minimum, finished floor elevations must be at least one foot above the 100-year floodplain elevations. If seasonal shallow groundwater areas are noted during construction, following mitigation measures should be implemented.

Any new foundations should be placed at least 40 inches below the finished exterior grade for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains should be installed to mitigate water intrusion into areas below grade. Proper grading (minimum 2%) should be done to direct surface water run-off around construction to avoid soil saturation or ponding.

Any organic material (including topsoil) should be completely removed from the construction area prior to the placement of fill.

Any potentially seasonal shallow groundwater areas may experience high subsurface moisture conditions and frost-heave potential. These lie within the drainages and low-lying areas and should be avoided using proper development methods or properly mitigated as discussed above. At the site, the potential does not exist for high groundwater during high moisture periods.

Erosion & Gullying: The areas that are undergoing severe erosion by water and sheetwash producing gullies and rill erosion were not noted during reconnaissance. Areas of erosion were not observed on site. Notwithstanding, due to the nature of on-site soils, majority of the site is subject to erosion by wind and water, unless proper geotechnical measures are implemented during construction. The presence of vegetation generally reduces the potential for erosion. Prior to or during construction, if eroding areas are identified, they should be mitigated using check dams, regrading, and revegetation using channel lining mats and erosion mats to anchor vegetation and promote vegetation. Specific recommendations pertaining to revegetation should be provided by a qualified landscape architect and/or the Natural Resource Conservation Service (previously Soil Conservation Service) officials.

Erosion Control: On-site soils are mildly to moderately susceptible to wind erosion, and moderately to highly susceptible to water erosion, when exposed. During and immediately after construction, minor wind erosion and dust may occur. This minor hazard may be mitigated by watering exposed and cut areas or the use of a chemical palliative may be considered to control dust. In our opinion, after the completion of construction and re-vegetation at the site, the wind erosion hazard will be significantly reduced.

Any exposed or loosely compacted soils will be the most susceptible to water erosion. In general, residually weathered soils and weathered bedrock materials are significantly less susceptible to water erosion than alluvial soils. For on-site alluvial soils, water erosion hazard can be minimized by limiting velocities for unvegetated and unlined earth channels to 3 to 4 feet/second, depending upon the sediment load carried by water. Allowable velocities can be increased to 4 to 7 feet/second provided adequate vegetation is used; final numbers depending upon the type of vegetation established. If anticipated velocities exceed these values, channel lining material or conventional riprap may be used to reduce erosion potential. In areas where ditch-lining materials are inadequate to control erosion, small check dams or sediment traps may be used. Check dams generally reduce flow velocities as well as provide small traps for containing sediment. A drainage engineer or civil engineer should determine the amount and location for the placement of ditch linings, check dams, and any special erosion control features.

We anticipate sheetwash and rill erosion in the proposed cut and fill slope areas, unless these areas are properly re-vegetated. It should be noted that the unchecked rill erosion eventually leads to concentrated flows of water, which result in gully erosion. Therefore, adequate re-vegetation of cut and fill slope area is important. Cut and fill slope areas steeper than 3H:1V are increasingly more difficult to revegetate. Such areas should be revegetated based on the specific recommendations given by a qualified landscape architect and/or the Soil Conservation Service official.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our geotechnical evaluation, in our opinion, the site is suitable for the proposed construction and/or proposed use change or modifications, provided following recommendations are strictly followed. It should be noted that our conclusions and recommendations are intended as design guidance. They are based on our interpretation of the geotechnical data obtained during our evaluation and following assumptions:

- Proposed/Final site grades or grading plans will be reviewed and approved by us to provide geotechnical design and to assure that proposed cut and fill activities do not adversely impact site stability;
- Proposed foundations will be constructed on level ground with the consideration of the results of our geologic hazards evaluation as described earlier; and
- Structural loads will be typical of single family residence.

Construction recommendations are provided to highlight aspects of construction that could affect the design of the project. Entities requiring information on various aspects of construction must make their own interpretation of the subsurface conditions to determine construction methods, cost, equipment, and work schedule.

SHALLLOW FOUNDATIONS (IF USED)

Conventional shallow foundations should be designed and constructed using the following recommendations:

- Over-excavate the subgrade by 24 inches, call AGS for open hole inspection, and once the subgrade is approved, backfill with free-draining structural fill compacted to at least 95% of ASTM D698 maximum dry density. Over-excavation recommendation can be modified or eliminated provided an open hole inspection is performed by AGS to evaluate subgrade soil moisture conditions, soil consistency, and soil uniformity at the foundation level, at the time of construction.
- Install adequate reinforcement and perimeter/foundation drains as shown in attached figures. All drainage systems should be discharged into suitable receptacles. Positive drainage away from buildings must be maintained at all times.
- Pour concrete only after all foundation subgrades and foundation drains are inspected and approved by a registered geotechnical engineer from our office.
- Provided above recommendations are strictly followed, foundations can be designed for a maximum allowable bearing capacity of **2,000** pounds per square foot (psf). For lateral load resistance, passive earth pressure value of 300 pcf equivalent fluid density may be used. A coefficient of friction value of 0.4 (unfactored) may be used for concrete foundation against sandy subgrade.

- Estimated final structural loads will dictate the final form and size of foundations to be constructed. However, as a minimum, we recommend bearing walls be supported by continuous footings of at least 24 inches in width. Isolated columns should be supported on pads with minimum dimensions of 36 inches square.
- Continuous foundation walls should be reinforced in the top and bottom to span an unsupported length of at least 8 feet to further aid in resisting differential movement. See attached figures.
- Exterior footings and footings in unheated areas should extend below design frost depth of 36 inches.
- Adequate shoring and underpinning should be provided to protect and support adjacent structures and property (if any) during excavation and construction.

We estimate total movement for foundations designed and constructed as discussed in this section will be 1.25 inch or less, with differential movement on the order of one-half to three-fourths of the total settlement.

SLAB-ON-GRADE (IF USED)

The “Slab Performance Risk” associated with existing sandy soils is “Low” for crawl-space construction and “low to moderate” for basement condition. Slab-on-grade is a viable option, however, the owner should be aware that there is always some potential risk associated with slab movement. A structural slab or a PTS slab is always a more reliable option, especially if the owner is not willing to assume any risk. In order to maintain the “Slab Performance Risk” to a level of ‘Low,’ over-excavation as recommended for the foundation should be performed for the slab areas. Over-excavation can be eliminated based on the results of open-hole inspection.

The actual slab movements that will occur on a particular project site are very difficult, if not impossible, to predict accurately because these movements depend on loads, evapo-transpiration cycles, surface and subsurface drainage, and settlement / collapse characteristics. The actual time of year during which the slab-on-grade is constructed has been found to have a large influence on future slab-on-grade movements.

Slab settlements are normally defined in terms of "total" and "differential" movement. "Total" movement refers to the maximum amount of settlement that the slab may experience as a whole. "Differential" movement refers to unequal settlement that different points of the same slab may experience, sometimes over relatively short horizontal distances. Differential movements are arbitrarily determined to be one-half of the total movement in soils exhibiting Low Slab

Performance Risk. Greater differential movements can occur in areas where loess soils have been encountered and where the natural soils abruptly transition to fill material.

For design of floor slabs, a modulus of subgrade reaction of 200 pounds per cubic inch (pci) may be used provided slab-on-grade is placed on properly prepared subgrades after the completion of soil modification procedures described earlier.

We recommend that the construction measures outlined in the following paragraphs be followed to reduce potential damage to floor slabs, should wetting of the subsurface soils occur:

- Separate floor slab from all bearing walls and columns with expansion joints to allow unrestrained vertical movement. Under any circumstances, floor slab should not extend beneath exterior doors or over foundation grade beams without saw cutting the slab at the beam after construction.
- Provide slip joints around exterior walls, interior non-bearing partitions. Use a float details as shown in attached figures.
- The connections between the interior, slab-supported partitions and exterior foundation supported walls should allow for differential movement. For slab-bearing masonry block partitions, provide slip joints at the top of the walls. Notwithstanding, if the floor moves, the partition walls may still show signs of structural distress such as cracking.
- If partition walls, masonry block walls, or any other walls without bottom slip joints are required, it is best to support them on grade beams which are, in turn, supported on piers. In other words, construct the slab independent of all foundations.
- If options are not available and slab-bearing partition walls are necessary, then the potential for structural distress may be reduced by connecting the partition walls to exterior walls using slip channels.
- Frequent control joints should be provided at about 10 feet spacing in the floor slab to reduce problems with shrinkage and cracking according to ACI specifications. Control joint spacing is a function of slab thickness, aggregate size, slump and curing conditions. The requirements for concrete slab thickness, joint spacing, and reinforcement should be established by the designer, based on experience, recognized design guidelines and the intended slab use. Placement and curing conditions will have a strong impact on the final concrete slab integrity. Floor slabs should be adequately reinforced.
- The need for a vapor barrier will depend on the sensitivity of floor coverings to moisture. If moisture sensitive floor coverings are proposed for portions of the proposed structure, a

capillary break material, typically consisting of a “clean” gravel, should be considered. We can provide additional recommendations if this is the case.

- Provided gravel is desired below the slab, a layer of 4 to 6 inches can be used. Plumbing passing through slabs should be isolated from the slabs and provided with flexible connections to allow for movement. A positive bond break should be provided where plumbing lines enter through the slab. Under slab, plumbing should be avoided if possible and should be brought above the slab as soon as possible.
- Where mechanical equipment and HVAC equipment are supported on slabs, we recommend provision of a flexible connection between the furnace and ductwork with a minimum of 1.5 inches of vertical movement.
- Sidewalks and other exterior flatwork should be separated from the slab and the slab should be designed as an independent unit.

STRUCTURAL FLOOR & CRAWL SPACE (IF USED)

Structural floors should not be constructed without a geotechnical design for the site after site grading plans and project design is completed and made available for our review. If structural floor is used, then the grade beams (if used) and floor system should be physically isolated from the underlying materials with crawl-space type construction. The void or crawl space of minimum of 6 inches or whatever is the minimum current International Building Code (UBC) requirement.

For crawl-space construction, various items should be considered in the design and construction that are beyond the scope of geotechnical scope of work for this project and require specialized expertise. Some of these include design considerations associated with clearance, ventilation, insulation, standard construction practice, and local building codes. If not properly drained and constructed, there is the potential for moisture to develop in crawl-spaces through transpiration of the moisture/groundwater within native soils underlying the structure, water intrusion from snowmelt and precipitation, and surface runoff or infiltration of water through irrigation of lawns and landscaping. In crawl space, excessive moisture or sustained elevated humidity can increase the potential for mold to develop on organic building materials. A qualified professional engineer in building systems should address moisture and humidity issues.

For the crawl space to remain free of moisture, it is important that drainage recommendations are properly implemented, and adequate inspections are performed prior to the placement of concrete.

- As a minimum, subgrade beneath a structural floor system should be graded so that water does not pond. Perimeter drains, and under-slab drains should be installed in conjunction with a sump pump system to eliminate the potential for ponding and any subsequent damage to foundation and slab elements. The lot-specific perimeter dewatering and underdrain systems should be properly designed and connected to the area underdrain system or a sump-pump system for suitable discharge from the lot.

- The underdrain system should consist of adequate lateral drains and a main drain, regular clean out and inspection locations, and proper connections to the sump-pump system for discharge into suitable receptacles located away from the site.

- Drainage recommendations illustrated in Figure 9 should be implemented.

- The entire design and construction team should evaluate, within their respective field of expertise, the current and potential sources of water throughout the life of the structure and provide any design/construction criteria to alleviate the potential for moisture changes. If recommended drain systems are used, the actual design/layout, outlets, locations, and construction means, and methods should be observed by a representative of AGS.

RETAINING WALLS (IF USED)

Retaining walls should not be constructed without a geotechnical design for the site after site grading plans and project design is completed and made available for our review.

In general, for preliminary design, retaining walls for at-rest conditions can be designed to resist an equivalent fluid density of 55 pcf for on-site granular materials. Retaining walls for unrestrained conditions (free lateral movement) can be designed to resist an equivalent fluid density of 50 pcf for on-site granular materials. For passive resistance of unrestrained walls, we recommend passive resistance of 300 psf per foot of wall height. A coefficient of friction value of 0.35 may be used for contact between the prepared soil surface and concrete base.

The above recommended values do not include a factor of safety or allowances for surcharge loads such as adjacent foundations, sloping backfill, vehicle traffic, or hydrostatic pressure. We should be contacted to provide additional recommendations for any specific site retaining conditions.

Retaining wall backfill should be placed in strict accordance with our earthwork recommendations given below. Backfill should not be over-compacted to minimize excessive lateral pressures on the walls. As a precautionary measure, a drainage collection system (drains or geosynthetic drains) should be included in the wall design to minimize hydrostatic pressures. A prefabricated drainage composite or drain board such as the MiraDrain 2000 or an engineer-approved equivalent may be installed along the backfilled side of the basement foundation wall.

SUBSURFACE DRAINAGE

Proper subsurface drainage is critical for long-term performance of the proposed structures. As a minimum, recommendations illustrated in attached figure and given below should be strictly followed.

- A perimeter drain/dewatering system should be installed to reduce the potential for groundwater entering foundation and slab areas.
- The subgrade beneath a structural floor system should be graded so that water does not pond. In addition, drain laterals that span the crawl space are recommended to prevent ponding of water within the crawlspace.
- As a minimum, the subsurface drainage system should consist typically of 4-inch minimum diameter perforated rigid PVC pipe surrounded by at least one pipe diameter of free draining gravel. The pipe should be wrapped in a geosynthetic to prevent fine soils from clogging the system in the future. The pipe should drain by gravity to a suitable all-weather outlet or to a properly designed area underdrain system. Surface cleanouts of the perimeter drain should be installed at minimum serviceability distances around the addition. A properly constructed drain system can result in a reduction of moisture infiltration of the subsurface soils. Drains which are improperly installed can introduce settlement or heave of the subsurface soils and could result in improper surface grading only compounding the potential issues.
- The entire design and construction team should evaluate, within their respective field of expertise, the current and potential sources of water throughout the life of the structure and provide any design/construction criteria to alleviate the potential for moisture changes. If recommended drain systems are used, the actual design/layout, outlets, and location should be designed by AGS. The construction means, and methods should be observed by a representative of AGS.

SURFACE DRAINAGE

A detailed drainage plan should be prepared by us once the site grading plans and project design is completed. In general, proper surface drainage should be maintained at this site during and after completion of construction operations. The ground surface adjacent to buildings should be sloped to promote rapid run-off of surface water. We recommend a minimum slope of six inches in the first five horizontal feet for landscaped or graveled areas. These slopes should be maintained during the service life of buildings.

Landscaping should be limited around building areas. Irrigation should be minimal and limited to maintain plants. Roof downspouts should discharge on splash-blocks or other impervious surfaces and directed away from the building. Ponding of water should not be allowed immediately adjacent to the building.

It is important to follow these recommendations to minimize settling of the foundation elements throughout the life of the facility. Construction means, and methods should also be utilized which minimizes saturation of soils during construction.

Again, positive drainage away from the new structures is essential to the successful performance of foundations and flatwork, and should be provided during the life of the structure. Paved areas within 10 feet of structures should slope at a minimum of 2 percent away from foundations, and landscape areas within 10 feet of structures should slope away at a minimum of 8 percent. Downspouts from all roof drains, if any, should cross all backfilled areas such that they discharge all water away from the backfill zones and structures. Drainage should be created such that water is diverted away from building sites and away from backfill areas of adjacent buildings.

EARTHWORK CONSTRUCTION

Once the grading plans are finalized, we should be contacted for specific earthwork recommendations, especially the stability of adjacent structures, shoring requirements, cut slopes, and construction dewatering. In any case, site grading should be carefully planned so that positive drainage away from all structures is achieved. As a minimum, following earthwork recommendations should be followed for all aspects of the project.

Fill Placement: Fill material should be placed in uniform horizontal layers (lifts) not exceeding 12 inches before compacting to the required density and before successive layers are placed. If the contractor's equipment is not capable of properly moisture conditioning and compacting 8-inch lifts, then the lift thickness shall be reduced until satisfactory results are achieved.

Import soils should be approved by AGS prior to placement. *Fill placement observations and fill compaction tests should be performed by AGS Engineering to minimize the potential for future problems.* Fill material should not be placed on frozen ground. Vegetation, roots, topsoil, the existing fill materials, and other deleterious material to depth of approximately 6 inches should be removed before new fill material is placed.

On-site fill to be placed should be moisture treated to within 2 percent of optimum moisture content (OMC) for sand fill. Fill to be placed in wall backfill areas and driveway areas and all other structural areas should be compacted to 95% of Modified Proctor (ASTM D1557) maximum dry density or greater. Compaction in landscape areas should be 85% or greater.

Imported structural fill should consist of sand or gravel material with a maximum particle size of 3 inches or less. In addition, this material shall have a liquid limit less than 30 and a plasticity index of 15 or less. Structural fill should also have a percent fine between 15 to 30 percent passing the No. 200 sieve. Structural fill should be moisture conditioned to within 2 percent of OMC and compacted to at least 95 percent of Modified Proctor (ASTM D1557) maximum dry density.

Excavation: In our opinion, the materials encountered at this site may be excavated with conventional mechanical excavating equipment. Although our borings did not encounter “buried” foundation elements or other structures or debris, these materials will most likely be encountered during excavation activities. Debris materials such as brick, wood, concrete, and abandoned utility lines, if encountered, should be removed from structural areas when encountered in excavations and either wasted from the site or placed in landscaped areas.

Temporary excavations should comply with OSHA and other applicable federal, state, and local safety regulations. In our opinion, OSHA Type B/C soils will be encountered at this site during excavation. OSHA recommends maximum allowable unbraced temporary excavation slopes of 1.25:1(H:V) for Type B/C soils for excavations up to 10 feet deep. Permanent cut and fill slopes are anticipated to be stable at slope ratios as steep as 2H:1V (horizontal to vertical) under dry conditions. New slopes should be revegetated as soon as possible after completion to minimize erosion.

We recommend a minimum of 15 feet of clearance between the top of excavation slopes and soil stockpiles or heavy equipment or adjacent structures (subject to approval of AGS). If braced excavations are to be used, they should be reviewed and designed by AGS. It should be noted that near-surface soils encountered at the site will be susceptible to some sloughing and excavations should be periodically monitored by AGS’s representative.

Once the grading plans and construction sequencing are finalized, we should be contacted to evaluate the need for shoring or underpinning. If shoring is deemed necessary, we should be contacted to provide detailed shoring plans to assure on-site stability during construction. Note that is the responsibility of the contractor and/or owner to assure site stability during and after construction.

Cold Weather: If earthwork is performed during the cold winter months when freezing might become a factor, no grading fill, structural fill or other fill should be placed on frosted or frozen ground, nor should frozen material be placed as fill. Frozen ground should be allowed to thaw or be completely removed prior to placement of fill. A good practice is to cover the compacted fill with a “blanket” of loose fill to help prevent the compacted fill from freezing overnight. The “blanket” of loose fill should be removed the next morning prior to resuming fill placement.

During cold weather, foundations, concrete slabs-on-grade, or other concrete elements should not be constructed on frozen soil. Frozen soil should be completely removed from beneath the concrete elements, or thawed, scarified and re-compacted. The amount of time passing between excavation or subgrade preparation and placing concrete should be minimized during freezing conditions to prevent the prepared soils from freezing. Blankets, soil cover or heating as required may be utilized to prevent the subgrade from freezing.

CONCRETE CONSTRUCTION

Concrete sidewalks and any other exterior concrete flatwork around the proposed structure may experience some differential movement and cracking. While it is not likely that the exterior flatworks can be economically protected from distress, we recommend following techniques to reduce the potential long-term movement:

- Scarify and re-compact at least 12 inches of subgrade material located immediately beneath structures.
- Avoid landscape irrigation adjacent to structures.
- Thicken or structurally reinforce the structures.

We recommend Type I-II cement for all concrete in contact with the soil on this site. Calcium chloride should not be added. Concrete must be protected from low temperatures and properly cured.

LIMITATIONS

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory evaluation, and our present knowledge of the proposed construction. It is possible that soil conditions could vary between or beyond the points explored. If soil conditions are encountered during construction that differ from those described herein, we should be notified so that we can review and make any supplemental recommendations necessary. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed and revised by AGS.

Our Scope of Work for this project did not include research, testing, or assessment relative to past or present contamination of the site by any source. If such contamination were present, it is very likely that the exploration and testing conducted for this report would not reveal its existence. If the Owner is concerned about the potential for such contamination, additional studies should be undertaken. We are available to discuss the scope of such studies with you. No tests were performed to detect the existence of mold or other environmental hazards as it was beyond Scope of Work.

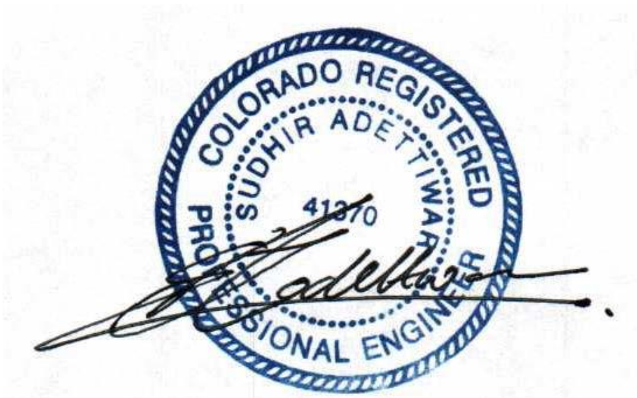
Local regulations regarding land or facility use, on and off-site conditions, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of the report within one year from the date of report preparation, AGS may recommend additional work and report updates. Non-compliance with any of these requirements by the client or anyone else will release AGS from any liability resulting from the use of this report by any unauthorized party. Client agrees to defend, indemnify, and hold harmless AGS from any claim or liability associated with such unauthorized use or non-compliance.

In this report, we have presented judgments based partly on our understanding of the proposed construction and partly on the data we have obtained. This report meets professional standards expected for reports of this type in this area. Our company is not responsible for the conclusions, opinions or recommendations made by others based on the data we have presented. Refer to American Society of Foundation Engineers (ASFE) general conditions included in an appendix.

This report has been prepared exclusively for the client, its' engineers and subcontractors for design and construction of the proposed structure. No other engineer, consultant, or contractor shall be entitled to rely on information, conclusions or recommendations presented in this document without the prior written approval of AGS.

We appreciate the opportunity to be of service to you on this project. If we can provide additional assistance or observation and testing services during design and construction phases, please call us at 1 888 276 4027.

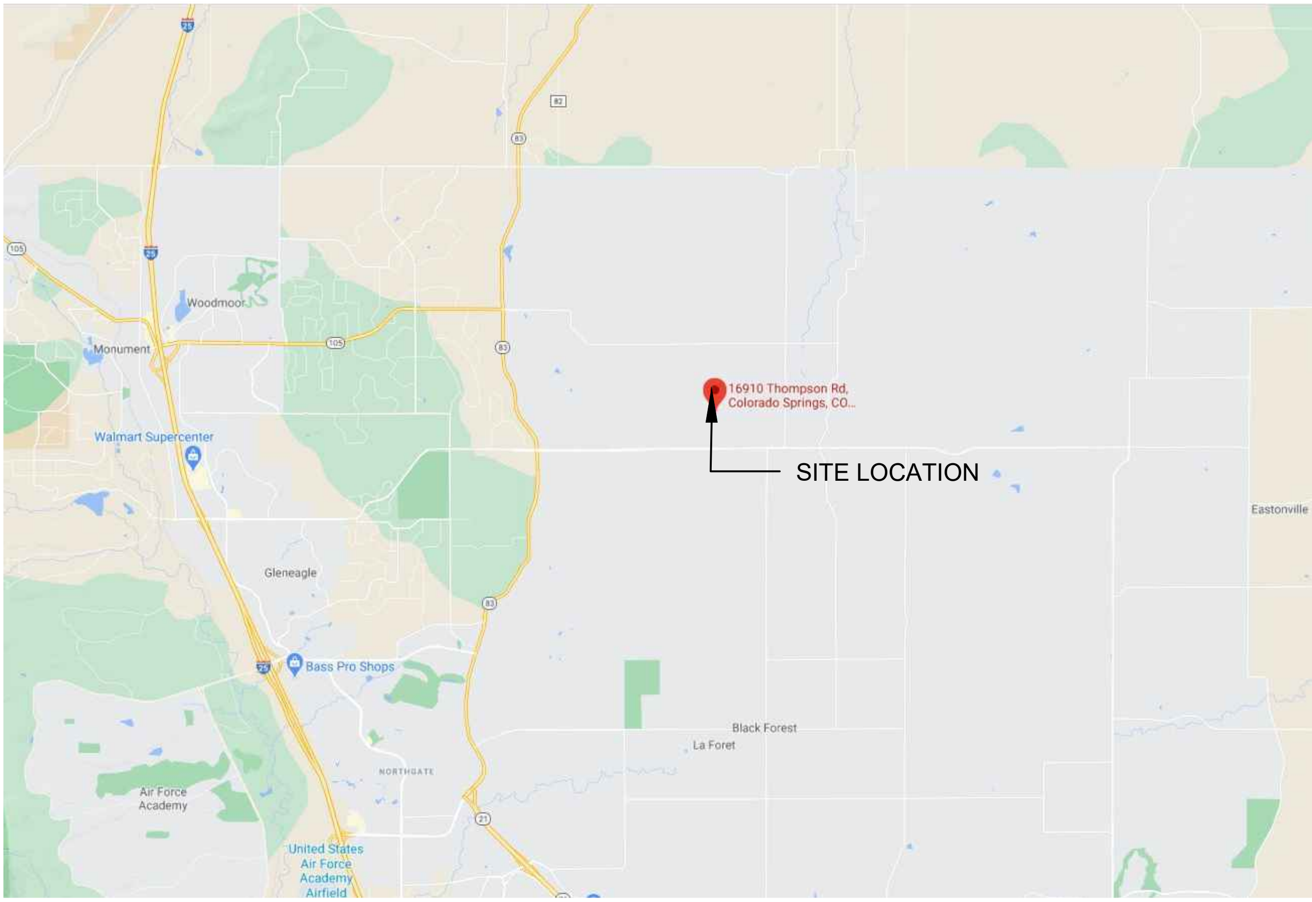
Sincerely,

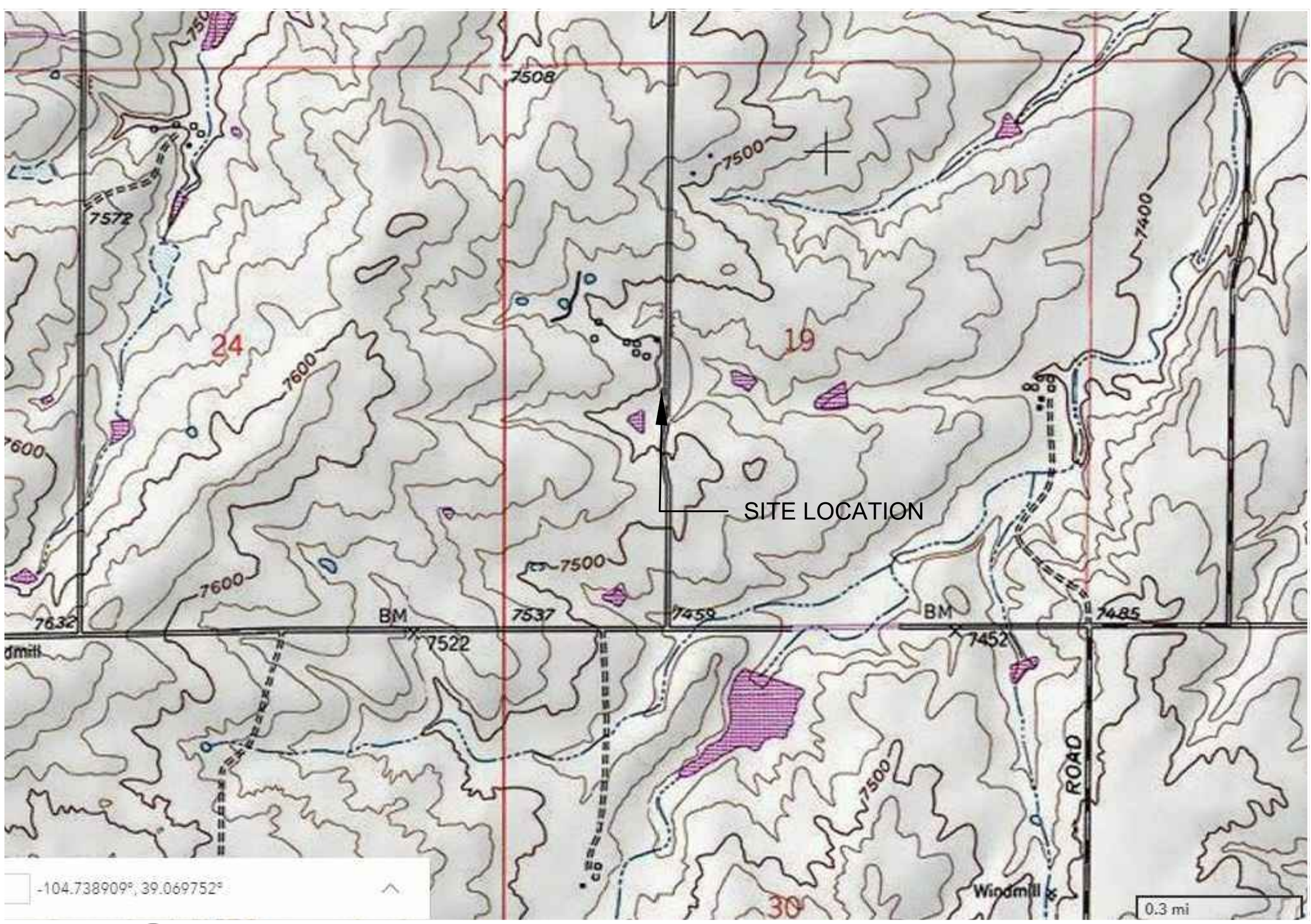


Sam Adettiwar, MS, PE, GE, P. Eng, M. ASCE
Senior Engineer

Attachments

FIGURES





N

REFERENCE:
GOOGLE MAPS
USGS TOPOGRAPHIC MAPS

AMERICAN GEOSERVICES
888.276.4027 - americangeoservices.com

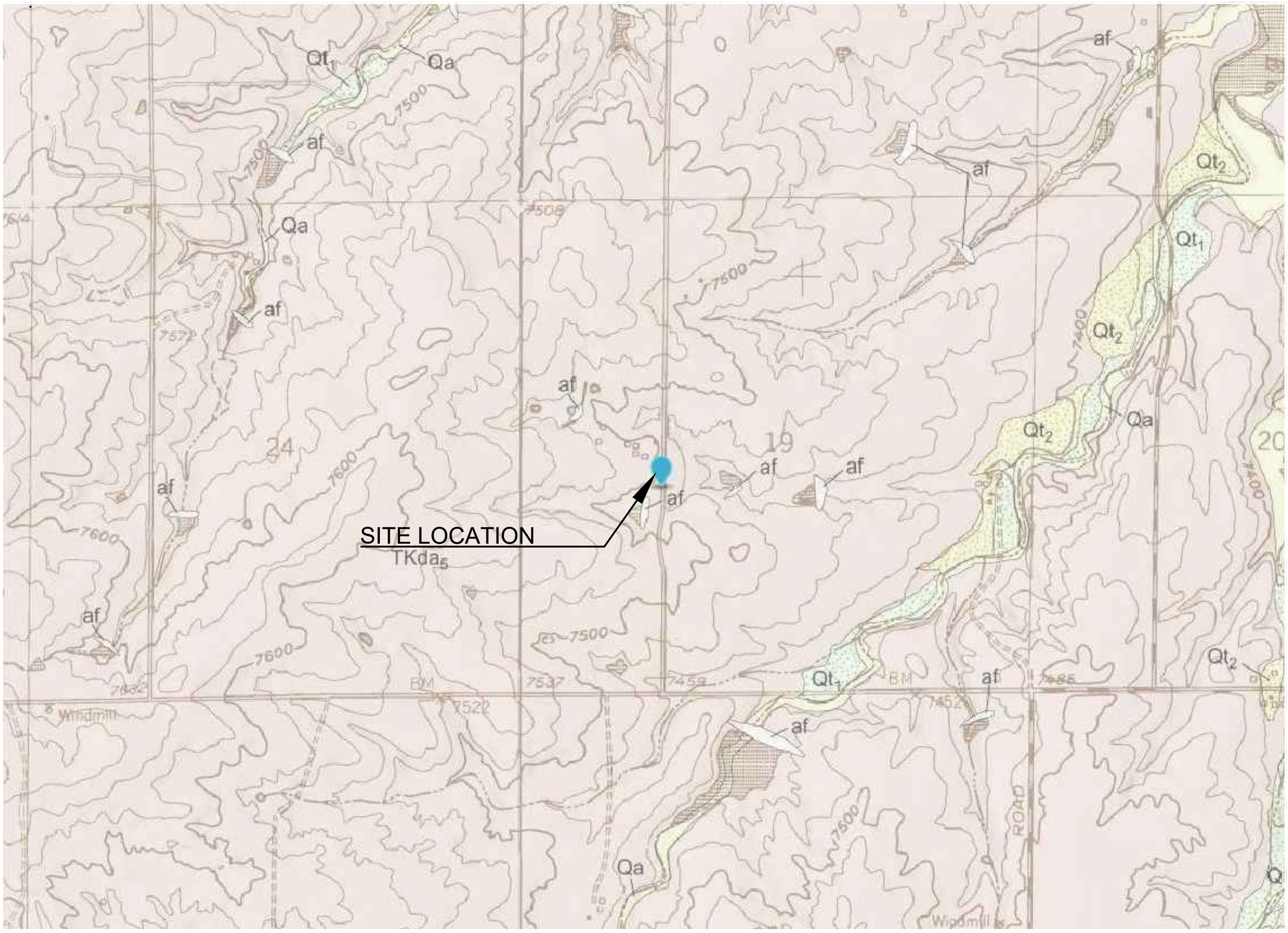
FIGURE 1: SITE LOCATION MAP

N

NOTE:
SCHEMATIC PLAN TO SHOW APPROXIMATE SUBSURFACE EXPLORATION LOCATION ONLY; NOT SURVEYED.

LEGEND:
DESIGNATES SUBSURFACE EXPLORATION LOCATION, BY AMERICAN GEOSERVICES, LLC. ,FEBRUARY 2021 SEE EXPLORATION LOG IN APPENDIX FOR FURTHER DETAILS.

REFERENCE: ELPASO COUNTY COLORADO GIS	AMERICAN GEOSERVICES 888.276.4027 - americangeoservices.com	FIGURE 2: SCHEMATIC SITE PLAN



LEGEND

Upper part of the Dawson Formation (Upper Cretaceous to Eocene)

$TKda_5$	Facies unit five (early to middle? Eocene)
$TKda_4$	Facies unit four (Paleocene)
$TKda_3$	Facies unit three (Paleocene)
$TKda_2$	Facies unit two (Upper Cretaceous to Paleocene)—Not shown on map or cross section
$TKda_1$	Facies unit one (Upper Cretaceous to Paleocene)—Not shown on map or cross section

ALLUVIAL DEPOSITS

Qa	Channel and flood-plain alluvium (late Holocene)
Qt_1	Terrace alluvium one (Holocene and late Pleistocene)
Qt_2	Terrace alluvium two (late middle Pleistocene)
Qt_3	Terrace alluvium three (late middle Pleistocene)
Qau	Alluvium, undivided (Holocene and Pleistocene)
Qp_1	Younger piedmont-slope alluvium (Holocene and late Pleistocene)
Qp_2	Middle piedmont-slope alluvium (middle Pleistocene)
QTa	Alluvium of Palmer Divide (early? Pleistocene or Pliocene?)

N

REFERENCE:
U.S. GEOLOGICAL MAPS

AMERICAN GEOSERVICES
888.276.4027 - americangeoservices.com

FIGURE 3: GEOLOGIC MAP

LEGEND

El Paso County Area, Colorado (CO625)

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
67	Peyton sandy loam, 5 to 9 percent slopes	51.9	60.8%
68	Peyton-Pring complex, 3 to 8 percent slopes	33.5	39.2%
Totals for Area of Interest		**85.3**	**100.0%**

N

REFERENCE:

WEB SOIL SURVEY

AMERICAN GEOSERVICES
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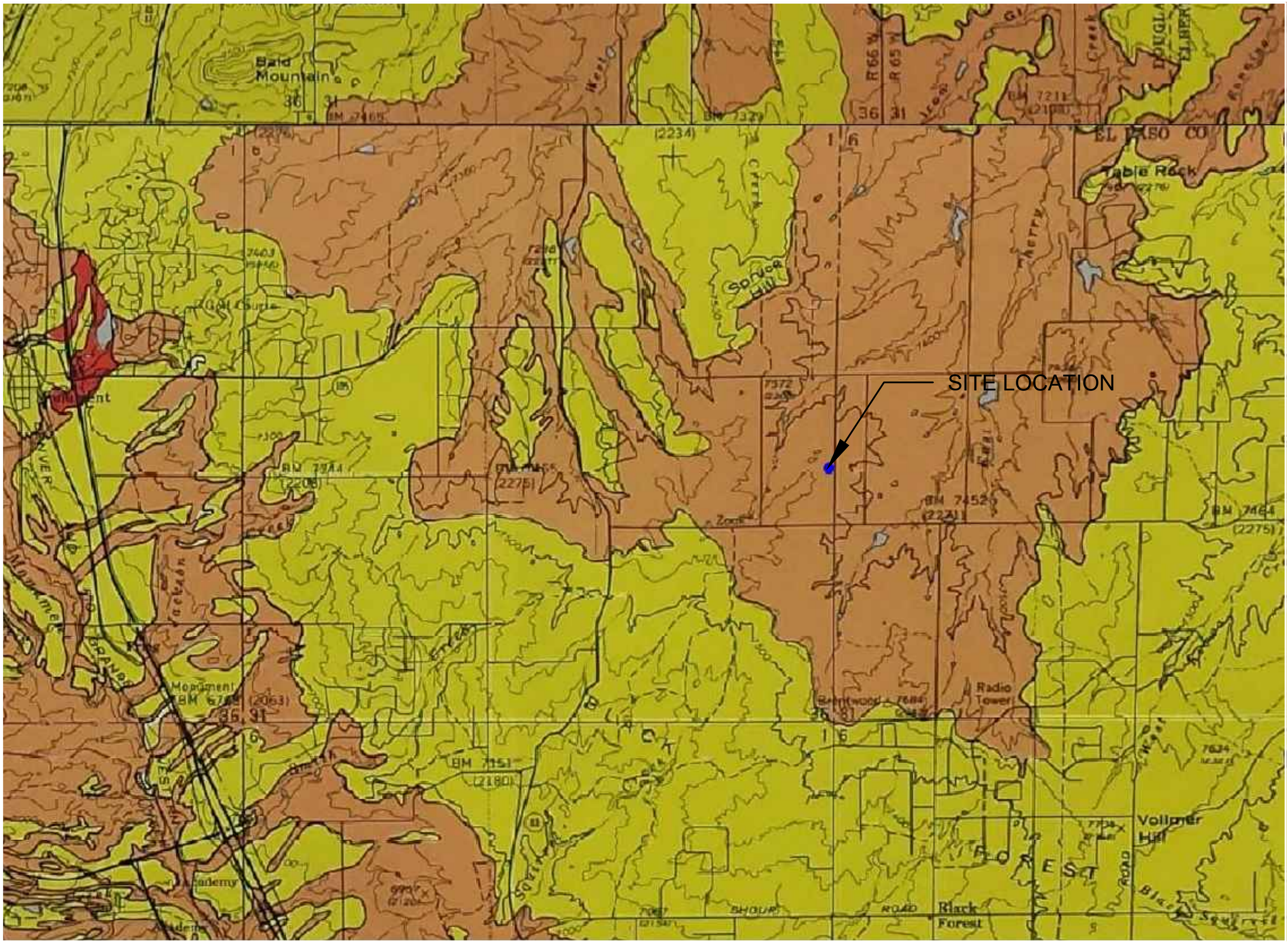
FIGURE 4: SOIL SURVEY MAP



LEGEND:

RED ZONE: VERY HIGH SWELL POTENTIAL: THIS CATEGORY INCLUDES ONLY BEDROCK OR WEATHERED BEDROCK. THE PRECAUTIONS LISTED BELOW UNDER "HIGH SWELL POTENTIAL" MUST BE UTILIZED.

BROWN ZONE: HIGH SWELL POTENTIAL: THIS CATEGORY GENERALLY INCLUDES ONLY BEDROCK, WEATHERED BEDROCK, AND COLLUVIUM. CAREFUL SITE INVESTIGATION, SPECIAL FOUNDATION DESIGN, AND PROPER POST-CONCTRUCTION LANDSCAPING AND MAINTENANCE ARE REQUIRED TO PREVENT OR MINIMIZE DAMAGE.

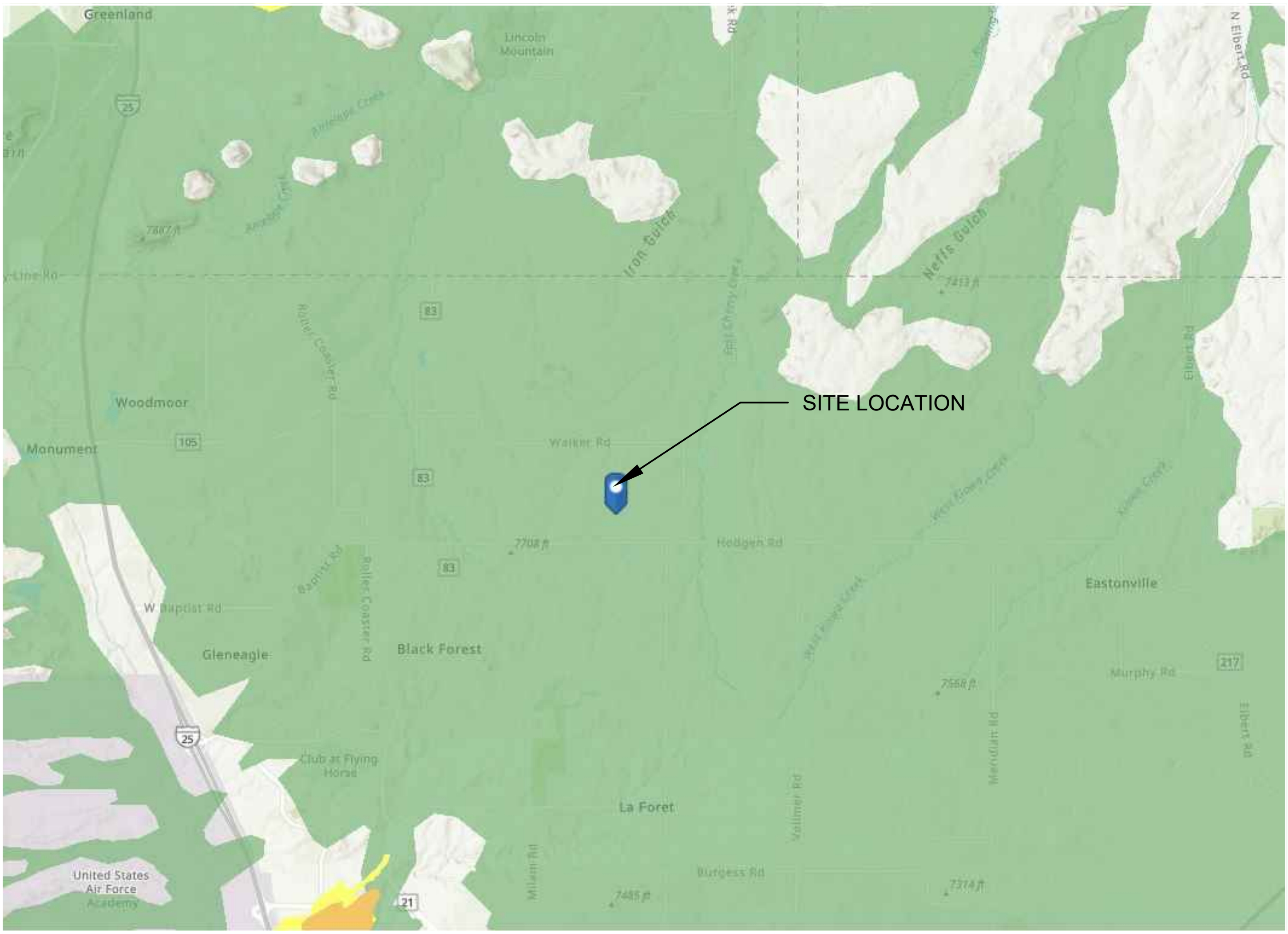
PALE BROWN ZONE: MODERATE SWELL POTENTIAL: THIS CATEGORY INCLUDES SEVERAL BEDROCK FORMATION AND A FEW SURFICIAL DEPOSITS OF VARIABLE THICKNESS. SPECIAL FOUNDATION DESIGNS ARE GENERALLY NESSARY TO PREVENT DAMAGE.

YELLOW ZONE: LOW SWELL POTENTIAL: THIS CATEGORY INCLUDES SEVERAL BEDROCK FORMATIONS AND MANY SURFICIAL DEPOSITS. THE THICKNESS OF THE SURFICIAL DEPOSITS MAY BE VARIABLE, THEREFORE, BEDROCK WITH A HIGHER SWELL POTENTIAL MAY LOCALLY BE LESS THAN 10 FT. BELOW THE SURFACE.

YELLOW HATCHED ZONE: WINDBLOWN SAND OR SILT: ALTHOUGH THIS MATERIAL GENERALLY HAS LOW SWELL POTENTIAL, THE UPPER 6 INCHES TO 12 INCHES MAY LOCALLY HAVE MODERATE SWELL POTENTIAL. WINDBLOWN MATERIAL MAY BE SUBJECT TO SEVERE SETTLEMENT OR HYDROCOMPACTION WHEN WATER IS ALLOWED TO SATURATE THE DEPOSITS. THE THICKNESS OF WINDBLOWN MATERIAL MAY BE VERY VARIABLE, THEREFORE, BEDROCK WITH HIGHER SWELL POTENTIAL MAY LOCALLY BE LESS THAN 10 FT BELOW THE SURFACE.

N

REFERENCE: COLORADO GEOLOGICAL SURVEY	AMERICAN GEOSERVICES 888.276.4027 - americangeoservices.com	FIGURE 5: SWELLING SOILS MAP



Legend

Collapsable_Soils_withMeeker

EG-14 Eolian (wind-blown) deposits

EG-14 Dune and sheet sand deposits

EG-14 Cretaceous and Tertiary Formations

EG-14 Evaporite Formations

N

REFERENCE:

COLORADO GEOLOGICAL SURVEY

AMERICAN GEOSERVICES
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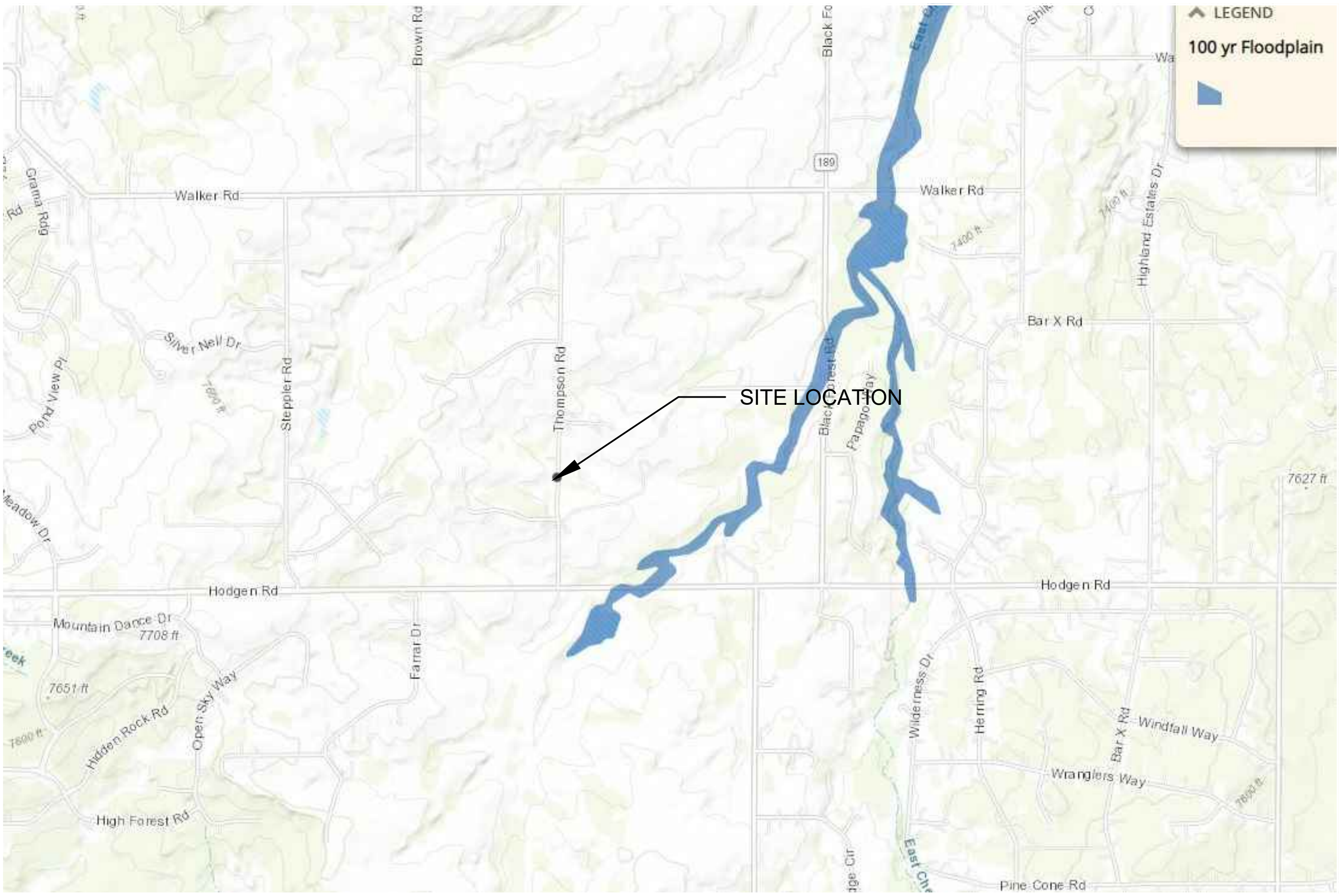
FIGURE 6: COLLAPSIBLE SOIL MAP



REFERENCE:

ELPASO COUNTY GIS

AMERICAN GEOSERVICES
888.276.4027 - americangeoservices.com

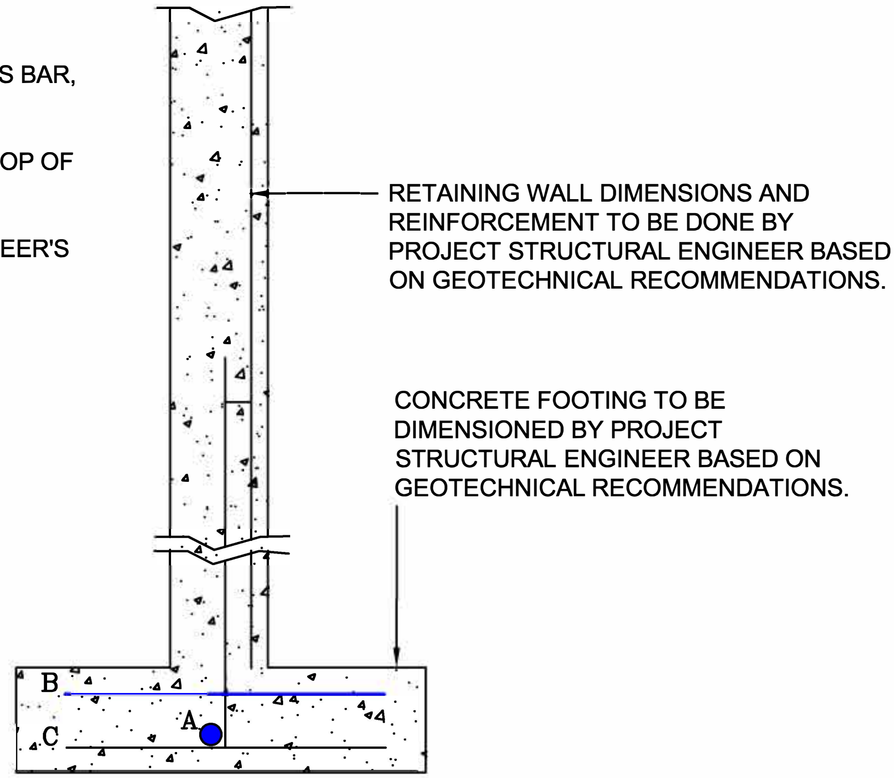
FIGURE 7: FLOOD HAZARD MAP

NOTES:

A. ADDITIONAL REINFORCEMENT, #4 CONTINUOUS BAR, BOTTOM OF FOOTING.

B. ADDITIONAL REINFORCEMENT, #4 AT 48" C/C, TOP OF FOOTING.

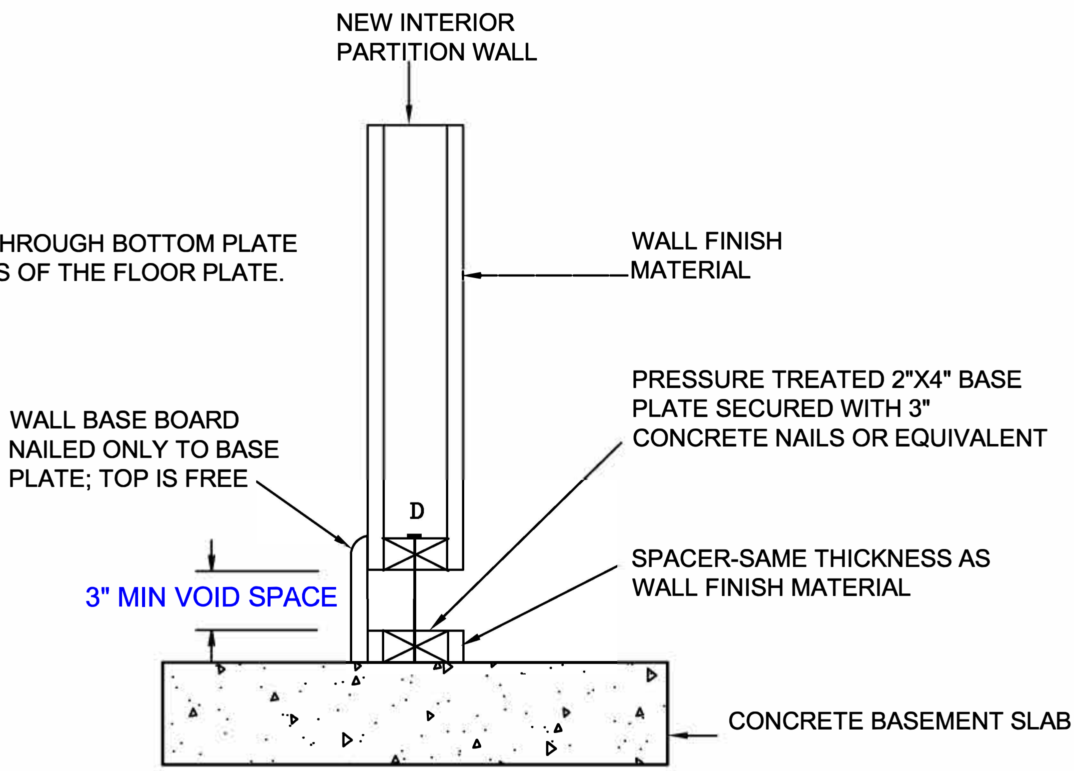
C. REINFORCEMENT AS PER STRUCTURAL ENGINEER'S DESIGN. AS A MINIMUM, USE #4 AT 48" C/C.



ADDITIONAL FOOTING REINFORCEMENT DETAIL

NOTES:

D. 40d NAILS EVERY 24" THROUGH BOTTOM PLATE INTO PRE-DRILLED HOLES OF THE FLOOR PLATE.



"FLOAT" (FLOATING WALL DETAIL)

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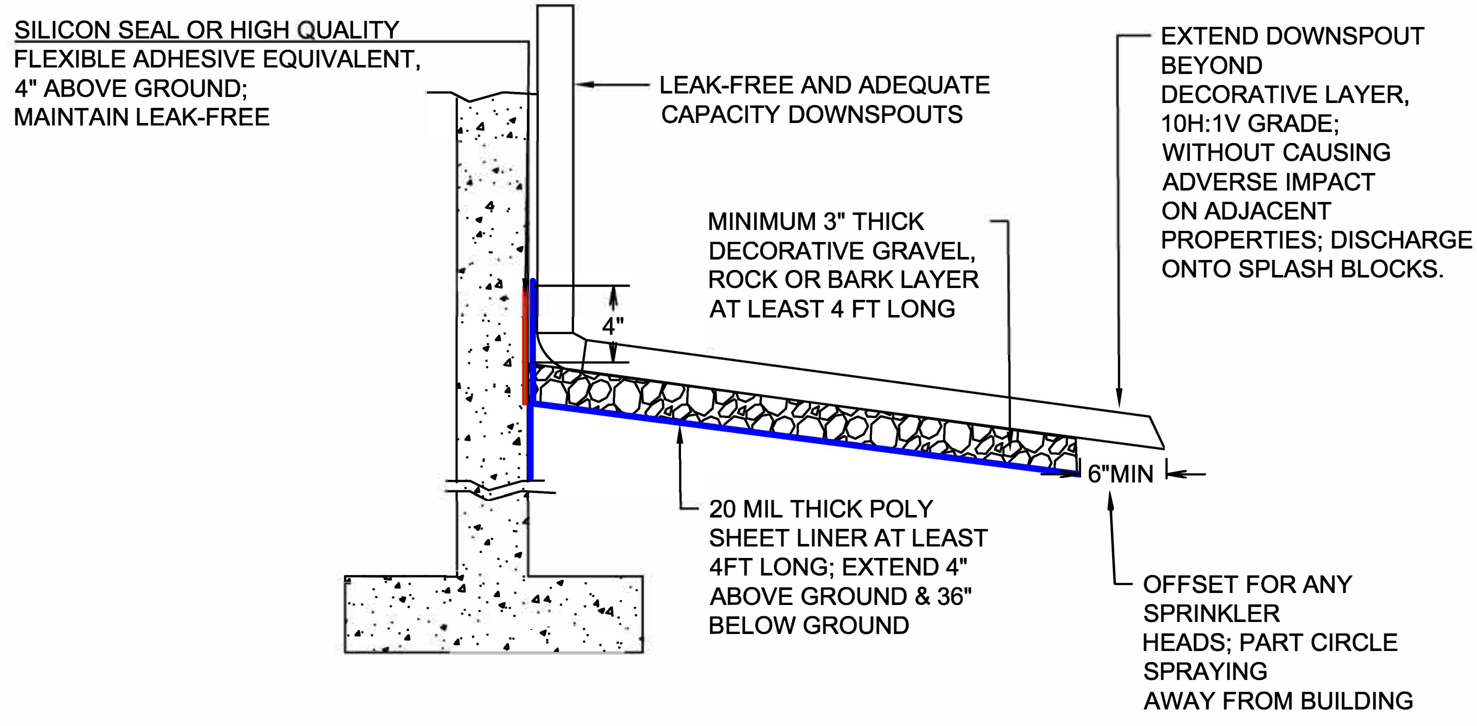
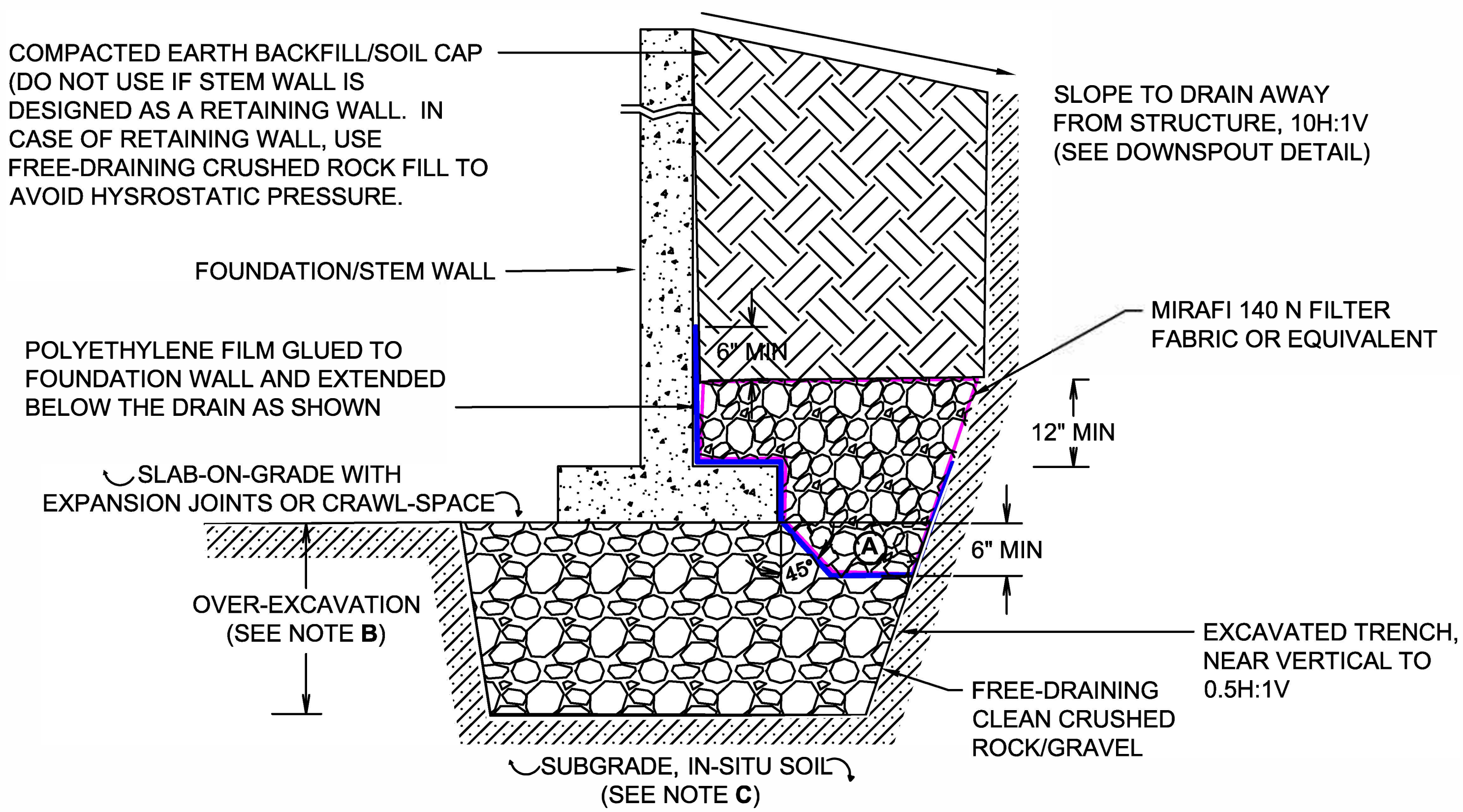
FIGURE 8: TYPICAL DETAILS



DOWNSPOUT & MOISTURE BARRIER DETAIL



PERIMETER OR FOUNDATION DRAIN DETAIL

NOTES: **A**. 4-INCH DIAMETER PERFORATED PIPE PLACED 2" ABOVE DRAIN SUBGRADE EMBEDDED IN FREE-DRAINING GRAVEL OR CRUSHED ROCK ENVELOPE WITH 2% GRADE TO SUMP PIT OR DISCHARGED TO A SUITABLE RECEPTACLE SUCH THAT ON-SITE AS WELL AS OFF-SITE STABILITY IS NOT ADVERSELY IMPACTED. **B**. DEPTH BASED ON OPEN HOLE INSPECTION, FOR SHALLOW FOUNDATION OPTION. **C**. ALL FOUNDATION OR OVER-EXCAVATED SUBGRADES MUST BE INSPECTED AND APPROVED BY A GEOTECHNICAL ENGINEER.

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FIGURE 9: DRAINAGE DETAILS

APPENDIX

B1

Project Number	0140-CS21	Drill Rig: CME55 Solid Stem Auger, 4" Diameter	
Geologist/Engineer	SMA	Ground Elevation	See Figures
Date Drilled	02-11-2021	Total Depth of Borehole	12 Feet
Borehole Diameter	4 OD Inches	Depth to Water	Not Encountered

Graphic Log		Description / Lithology	Depth (feet)	Sample	SPT Blow Count	Recovery (%)	Moisture (%)	DD (pcf)	LL (%), PL (%)	Swell (%)	Completion
		Topsoil 6.0"									
	SP/ GP	SILTY GRAVELLY SAND to GRAVELLY SAND, fine to medium grained, brown, loose to medium dense, moist	2.5	X	7-7-8						
			5.0	X	9-10-11						
	SM	SILTY SAND to with GRAVEL, fine to medium grained, brown, Imedium dense, moist									
	GM /SM	SANDY GRAVELLY SILT to SILTY GRAVELLY SAND, grey, orange mottling, stiff to very stiff, moist	7.5	X	10-10-12						
		Possibly weathered ARKOSE	10	X	50+						
		End of Borehole at 12 feet due to hard drilling on gravel. Groundwater seepage was not encountered during or at the completion of drilling at 12 feet. At completion, borehole was backfilled with soil cuttings.	15								

B2

Project Number	0140-CS21	Drill Rig: CME55 Solid Stem Auger, 4" Diameter	
Geologist/Engineer	SMA	Ground Elevation	See Figures
Date Drilled	02-11-2021	Total Depth of Borehole	12 Feet
Borehole Diameter	4 OD Inches	Depth to Water	Not Encountered

Graphic Log		Description / Lithology	Depth (feet)	Sample	SPT Blow Count	Recovery (%)	Moisture (%)	DD (pcf)	LL (%), PL (%)	Swell (%)	Completion
		Topsoil 6.0"									
	SP/ GP	SILTY GRAVELLY SAND to GRAVELLY SAND, fine to medium grained, brown, loose to medium dense, moist	2.5								
			5.0		8-11-13						
	GM /SM	SANDY GRAVELLY SILT to SILTY GRAVELLY SAND, grey, orange mottling, stiff to very stiff, moist	7.5								
		Possibly weathered ARKOSE	10								
		End of Borehole at 12 feet due to hard drilling on gravel. Groundwater seepage was not encountered during or at the completion of drilling at 12 feet. At completion, borehole was backfilled with soil cuttings.	15								

B3-B4

Project Number	0140-CS21	Drill Rig: CME55 Solid Stem Auger, 4" Diameter	
Geologist/Engineer	SMA	Ground Elevation	See Figures
Date Drilled	02-11-2021	Total Depth of Borehole	5 Feet
Borehole Diameter	4 OD Inches	Depth to Water	Not Encountered

Graphic Log		Description / Lithology	Depth (feet)	Sample	SPT Blow Count	Recovery (%)	Moisture (%)	DD (pcf)	LL (%), PL (%)	Swell (%)	Completion
		Topsoil 6.0"									
	SP/ GP	SILTY GRAVELLY SAND to GRAVELLY SAND, fine to medium grained, brown, loose to medium dense, moist	2.5		8-10-50+						
		End of Borehole at 5 feet due to hard drilling on gravel. Groundwater seepage was not encountered during or at the completion of drilling. At completion, borehole was backfilled with soil cuttings.	5.0								
			7.5								
			10								
			15								

B5

Project Number	0140-CS21	Drill Rig: CME55 Solid Stem Auger, 4" Diameter	
Geologist/Engineer	SMA	Ground Elevation	See Figures
Date Drilled	02-11-2021	Total Depth of Borehole	7.5 Feet
Borehole Diameter	4 OD Inches	Depth to Water	Not Encountered

Graphic Log		Description / Lithology	Depth (feet)	Sample	SPT Blow Count	Recovery (%)	Moisture (%)	DD (pcf)	LL (%), PL (%)	Swell (%)	Completion
		Topsoil 6.0"									
	ML	SILT, fine to medium grained, brown, medium stiff, moist, low plasticity									
			2.5								
	SP/ GP	SILTY GRAVELLY SAND to GRAVELLY SAND, fine to medium grained, brown, loose to medium dense, moist									
			5.0								
				X	9-50+						
			7.5								
		End of borehole at 7.5 feet due to hard drilling on gravel. Groundwater seepage was not encountered during or at the completion of drilling. At completion, borehole was backfilled with soil cuttings.									
			10								
			15								

B6

Project Number	0140-CS21	Drill Rig: CME55 Solid Stem Auger, 4" Diameter	
Geologist/Engineer	SMA	Ground Elevation	See Figures
Date Drilled	02-11-2021	Total Depth of Borehole	7.5 Feet
Borehole Diameter	4 OD Inches	Depth to Water	Not Encountered

Graphic Log	Description / Lithology	Depth (feet)	Sample	SPT Blow Count	Recovery (%)	Moisture (%)	DD (pcf)	LL (%), PL (%)	Swell (%)	Completion
	Topsoil 6.0"									
ML	SILT, fine to medium grained, brown, medium stiff, moist, low plasticity	2.5								
SP/GP	SILTY GRAVELLY SAND to GRAVELLY SAND, fine to medium grained, brown, loose to medium dense, moist	5.0								
		7.5	X	50+						
	End of borehole at 7.5 feet due to hard drilling on gravel. Groundwater seepage was not encountered during or at the completion of drilling. At completion, borehole was backfilled with soil cuttings.	10								
		15								

DESCRIPTIVE TERMINOLOGY & SOIL CLASSIFICATION
UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size		Clean Gravels (Less than 5% fines)
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines (More than 12% fines)
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size		Clean Sands (Less than 5% fines)
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
		Sands with fines (More than 12% fines)
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

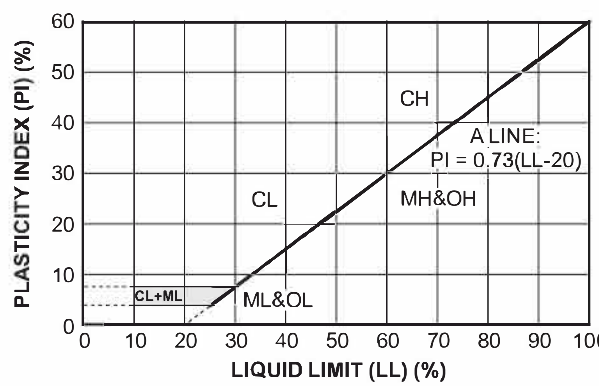
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent .... GW, GP, SW, SP
More than 12 percent .... GM, GC, SM, SC
5 to 12 percent .... Borderline cases requiring dual symbols

PLASTICITY CHART



DESCRIPTIVE TERMINOLOGY & SOIL CLASSIFICATION

LABORATORY/FIELD TESTING DEFINITIONS FOR EXPLORATION LOGS

DD = DRY DENSITY (PCF)

WD = WET DENSITY (PCF)

MC = MOISTURE CONTENT (%)

PL = PLASTIC LIMIT (%)

LL = LIQUID LIMIT (%)

PI = PLASTICITY INDEX

OC = ORGANIC CONTENT (%)

S = SATURATION PERCENT (%)

SG = SPECIFIC GRAVITY

C = COHESION

Φ = ANGLE OF INTERNAL FRICTION

QU = UNCONFINED COMPRESSION STRENGTH

#200 = PERCENT PASSING THE #200 SIEVE

CBR = CALIFORNIA BEARING RATIO

VS = VANE SHEAR

PP = POCKET PENETROMETER

DP = DRIVE PROBE

SPT = STANDARD PENETRATION TEST

BPF = BLOWS PER FOOT (N VALUE)

SH = SHELBY TUBE SAMPLE

GW = GROUND WATER

RQD = ROCK QUALITY DESIDNATION

TP = TEST PIT

B = BORING

HA = HAND AUGER

GROUNDWATER LEVEL/SEEPAGE ENCOUNTERED DURING EXPLORATION

STATIC GROUNDWATER LEVEL WITH DATE MEASURED

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STP (BPF)	PP (TSF)
VERY SOFT	0-1	LESS THAN 0.25
SOFT	2 - 4	0.25 - 0.5
MEDIUM STIFF	5 - 8	0.5 - 1.0
STIFF	9 - 15	1.0 - 2.0
VERY STIFF	16 - 30	2.0 - 4.0
HARD	30+	OVER 4.0

RELATIVE DENSITY OF COHESIONLESS SOILS

DENSITY	SPT (BPF)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	50+

PARTICLE SIZE IDENTIFICATION

NAME	DIAMETER (INCHES)	SIEVE NO.
ROCK BLOCK	>120	
BOULDER	12-120	
COBBLE	3-12	
GRAVEL		
COURSE	3/4 - 3	
FINE	1/4 – 3/4	NO. 4
SAND		
COARSE	4.75 MM	NO. 10
MEDIUM	2.0MM	NO. 40
FINE	.425 MM	NO. 200
SILT	.075 MM	
CLAY	<0.005 MM	

GRAIN SIZE

FINE GRAINED	<0.04 INCH	FEW GRAINS ARE DISTINGUISHABLE IN THE FIELD OR WITH HAND LENS.
MEDIUM GRAINED	0.04-0.2 INCH	GRAINS ARE DISTINGUISHABLE WITH THE AID OF A HAND LENS.
COARSE GRAINED	0.04-0.2 INCH	MOST GRAINS ARE DISTINGUISHABLE WITH THE NAKED EYE.

DESCRIPTIVE TERMINOLOGY & SOIL CLASSIFICATION

SPT EXPLORATIONS:

STANDARD PENETRATION TESTING IS PERFORMED BY DRIVING A 2 – INCH O.D. SPLIT-SPOON INTO THE UNDISTURBED FORMATION AT THE BOTTOM OF THE BORING WITH REPEATED BLOWS OF A 140 – POUND PIN GUIDED HAMMER FALLING 30 INCHES. NUMBER OF BLOWS (N VALUE) REQUIRED TO DRIVE THE SAMPLER A GIVEN DISTANCE WAS CONSIDERED A MEASURE OF SOIL CONSISTENCY.

SH SAMPLING:

SHELBY TUBE SAMPLING IS PERFORMED WITH A THIN WALLED SAMPLER PUSHED INTO THE UNDISTURBED SOIL TO SAMPLE 2.0 FEET OF SOIL.

AIR TRACK EXPLORATION:

TESTING IS PERFORMED BY MEASURING RATE OF ADVANCEMENT AND SAMPLES ARE RETRIEVED FROM CUTTINGS.

HAND AUGUR EXPLORATION:

TESTING IS PREFORMED USING A 3.25" DIAMETER AUGUR TO ADVANCE INTO THE EARTH AND RETRIEVE SAMPLES.

DRIVE PROBE EXPLORATIONS:

THIS "RELATIVE DENSITY" EXPLORATION DEVICE IS USED TO DETERMINE THE DISTRIBUTION AND ESTIMATE STRENGTH OF THE SUBSURFACE SOIL AND DECOMPRESSED ROCK UNITS. THE RESISTANCE TO PENETRATION IS MEASURED IN BLOWS-PER-1/2 FOOT OF AN 11-POUND HAMMER WHICH FREE FALLS ROUGHLY 3.5 FEET DRIVING THE 0.5 INCH DIAMETER PIPE INTO THE GROUND. FOR A MORE DETAILED DESCRIPTION OF THIS GEOTECHNICAL EXPLORATION METHOD, THE SLOPE STABILITY REFERENCE GUIDE FOR NATIONAL FORESTS IN THE UNITED STATES, VOLUME I, UNITED STATES DEPARTMENT OF AGRICULTURE, EM-7170-13, AUGUST 1994, P. 317-321.

CPT EXPLORATION:

CONE PENETROMETER EXPLORATIONS CONSIST OF PUSHING A PROBE CONE INTO THE EARTH USING THE REACTION OF A 20-TON TRUCK. THE CONE RESISTANCE (QC) AND SLEEVE FRICTION (FS) ARE MEASURED AS THE PROBE WAS PUSHED INTO THE EARTH. THE VALUES OF QC AND FS (IN TSF) ARE NOTED AS THE LOCALIZED INDEX OF SOIL STRENGTH.

ANGULARITY OF GRAVEL & COBBLES

ANGULAR	COARSE PARTICLES HAVE SHARP EDGES AND RELATIVELY PLANE SIDES WITH UNPOLISHED SURFACES.
SUBANGULAR	COARSE GRAINED PARTICLES ARE SIMILAR TO ANGULAR BUT HAVE ROUNDED EDGES.
SUBROUNDED	COARSE GRAINED PARTICLES HAVE NEARLY PLANE SIDES BUT HAVE WELL ROUNDED CORNERS AND EDGES.
ROUNDED	COARSE GRAINED PARTICLES HAVE SMOOTHLY CURVED SIDES AND NO EDGES.

SOIL MOISTURE MODIFIER

DRY	ABSENCE OF MOISTURE; DUSTY, DRY TO TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER

WEATHERED STATE

FRESH	NO VISIBLE SIGN OF ROCK MATERIAL WEATHERING; PERHAPS SLIGHT DISCOLORATION IN MAJOR DISCONTINUITY SURFACES.
SLIGHTLY WEATHERED	DISCOLORATION INDICATES WEATHERING OF ROCK MATERIAL AND DISCONTINUITY SURFACES. ALL THE ROCK MATERIAL MAY BE DISCOLORED BY WEATHERING AND MAY BE SOMEWHAT WEAKER EXTERNALLY THAN ITS FRESH CONDITION.
MODERATELY WEATHERED	LESS THAN HALF OF THE ROCK MATERIAL IS DECOMPOSED AND/OR DISINTEGRATED TO SOIL. FRESH OR DISCOLORED ROCK IS PRESENT EITHER AS A CONTINUOUS FRAMEWORK OR AS CORE STONES.
HIGHLY WEATHERED	MORE THAN HALF OF THE ROCK MATERIAL IS DECOMPOSED AND/OR DISINTEGRATED TO SOIL. FRESH OR DISCOLORED ROCK IS PRESENT EITHER AS DISCONTINUOUS FRAMEWORK OR AS CORE STONE.
COMPLETELY WEATHERED	ALL ROCK MATERIAL IS DECOMPOSED AND/OR DISINTEGRATED TO SOIL. THE ORIGINAL MASS STRUCTURE IS STILL LARGELY INTACT.
RESIDUAL SOIL	ALL ROCK MATERIAL IS CONVERTED TO SOIL. THE MASS STRUCTURE AND MATERIAL FABRIC IS DESTROYED. THERE IS A LARGE CHANGE IN VOLUME, BUT THE SOIL HAS NOT BEEN SIGNIFICANTLY TRANSPORTED.

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d
Elevation: 6,800 to 7,600 feet
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 115 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

As the client of a consulting geotechnical engineer, you should know that site subsurface conditions cause more construction problems than any other factor. ASFE/the Association of Engineering Firms Practicing in the Geosciences offers the following suggestions and observations to help you manage your risks.

A GEOTECHNICAL ENG.NEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS Your geotechnical engineering report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. These factors typically include: the general nature of the structure involved, its size, and configuration; the location of the structure on the site; other improvements, such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask your geotechnical engineer to evaluate how factors that change subsequent to the date of the report may affect the report's recommendations.

Unless your geotechnical engineer indicates otherwise, do not use your geotechnical engineering report:

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL JUDGMENTS
Site exploration identifies actual subsurface conditions only at those points where samples are taken. The data were extrapolated by your geotechnical engineer who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates, Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations. you and your geotechnical engineer can work together to help minimize their impact. Retaining your geotechnical engineer to observe construction can be particularly beneficial in this respect.

- when the nature of the proposed structure is changed. for example, if an office building will be erected instead of a parking garage, or a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size, elevation. or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership; or .for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems that may occur if they are not consulted after factors considered in their report's development have changed.

A REPORT'S RECOMMENDATIONS CAN ONLY BE PRELIMINARY
The construction recommendations included in your geotechnical engineer's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site.

Because actual subsurface conditions can be discerned only during earthwork, you should retain your geo- technical engineer to observe actual conditions and to finalize recommendations. Only the geotechnical engineer who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations are valid and whether or not the contractor is abiding by applicable recommendations. The geotechnical engineer who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

SUBSURFACE CONDITIONS CAN CHANGE A geotechnical engineering report is based on condi-tions that existed at the time of subsurface exploration. Do not base construction decisions on a geotechnical engineering report whose adequacy may have been affected by time. Speak with your geotechnical consult- ant to learn if additional tests are advisable before construction starts. Note, too, that additional tests may be required when subsurface conditions are affected by construction operations at or adjacent to the site, or by natural events such as floods, earthquakes, or ground water fluctuations. Keep your geotechnical consultant apprised of any such events.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS
Consulting geotechnical engineers prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your geotechnical engineer prepared your report expressly for you and expressly for purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the geotechnical engineer. No party should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

GEOENVIRONMENTAL CONCERNS ARE NOT AT ISSUE
Your geotechnical engineering report is not likely to relate any findings, conclusions, or recommendations

about the potential for hazardous materials existing at the site. The equipment, techniques, and personnel used to perform a geoenvironmental exploration differ substantially from those applied in geotechnical engineering. Contamination can create major risks. If you have no information about the potential for your site being contaminated. you are advised to speak with your geotechnical consultant for information relating to geoenvironmental issues.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION Costly problems can occur when other design profes- sionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid misinterpretations, retain your geotechnical engineer to work with other project design professionals who are affected by the geotechnical report. Have your geotechnical engineer explain report implications to design professionals affected by them. and then review those design professionals' plans and specifications to see how they have incorporated geotechnical factors. Although certain other design professionals may be fam- iliar with geotechnical concerns, none knows 'as much about them as a competent geotechnical engineer.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE REPORT Geotechnical engineers develop final boring logs based upon their interpretation of the field logs (assembled by site personnel) and laboratory evaluation of field samples. Geotechnical engineers customarily include only final boring logs in their reports. Final boring logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings. because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs. delays. disputes. and unanticipated costs ara the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, give contractors ready access to the complete geotechnical engineering report prepared or authorized for their use. (If access is provided only to the report prepared for you, you should advise contractors of the report's limitations. assuming that a contractor was not one of the specific persons for whom the report was prepared and that developing construction cost estimates was not one of the specific purposes for which it was prepared. In other words. while a contractor may gain important knowledge from a report prepared for another party, the contractor would be well-advised to discuss the report with your geotechnical engineer and to perform the additional or alternative work that the contractor believes may be needed to obtain the data specifically appropriate for construction cost estimating purposes.) Some clients believe that it is unwise or unnecessary to give contractors access to their geo- technical engineering reports because they hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems. It also helps reduce the adversarial attitudes that can aggravate problems to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY
Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical engineers. To help prevent this problem, geotechnical engineers have developed a number of clauses for use in their contracts, reports, and other documents. Responsibility clauses are not exculpatory clauses designed to transfer geotechnical engineers' liabilities to other parties. Instead, they are definitive clauses that identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report. Read them closely. Your geotechnical engineer will be pleased to give full and frank answers to any questions.

RELY ON THE GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE
Most ASFE-member consulting geotechnical engineering firms are familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a construction project, from design through construction. Speak with your geotechnical engineer not only about geotechnical issues, but others as well, to learn about approaches that may be of genuine benefit. You may also wish to obtain certain ASFE publications. Contact a member of ASFE of ASFE for a complimentary directory of ASFE publications.

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