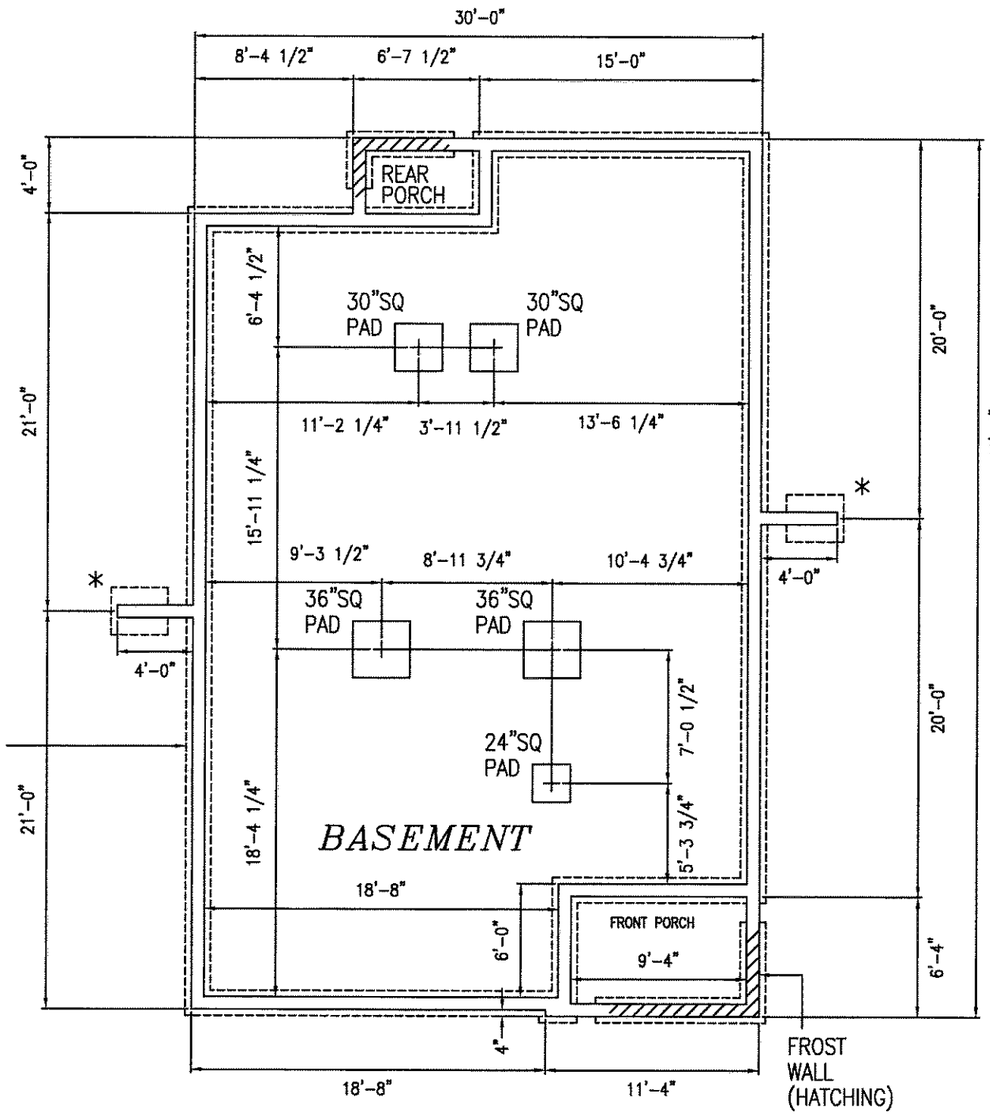
NOTE: PADS, PIERS, AND FOOTERS MUST BE PLACED ON COMPACTED STRUCTURAL FILL. ALLOW A 12" GAP IN THE FOOTER AS SHOWN FOR THE PERIMETER DRAIN.

16" WIDE x 7.5" THICK REINFORCED CONCRETE FOOTER CENTERED UNDER AN 8" REINFORCED CONCRETE FOUNDATION PERIMETER WALL. REINFORCE FOOTER W/TWO #4/60 REBAR HELD 3" FROM BOTTOM AND SIDES (U.O.N.)



BUILDER TO VERIFY ALL DIMENSIONS PRIOR TO ANY CONSTRUCTION. SEE THE ARCHITECTURAL PLANS FOR ANY ADDITIONAL DIMENSIONS.

DESIGN LOADS: LL/DL
ROOF LOAD: 30/15 PSF
FLOOR LOAD: 40/10 PSF
DECK LOAD: NO DECK

* 8" REINFORCED CONCRETE BUTTRESS WALL – HEIGHT TO WITHIN 12 INCHES FROM TOP OF FINISHED GRADE WITH HORIZONTAL STEEL TIED TO STEEL IN INTERSECTING FOUNDATION WALL 24 INCHES MINIMUM, AND PLACE VERTICAL STEEL @ 12" O.C. BEGINNING 3 INCHES FROM THE END OF THE WALL AND SET ON A 30" WIDE x 7.5" THICK CONCRETE FOOTER REINFORCED WITH TWO #4/60 REBAR HELD 3" FROM BOTTOM AND SIDES, BOTH WAYS, AND WITH VERTICAL STEEL EXTENDED INTO FOOTER. ALLOW A 12" GAP IN THE FOOTER (AS SHOWN) FOR THE PERIMETER DRAIN.

EUFER GROUNDING ROD MUST BE TIED TO BOTH THE FOOTER STEEL AND WALL STEEL PER THE PPRBD "EUFER ROD GROUNDING HANDOUT" (REFER TO THE PPRBD WEBSITE OR CONTACT OUR OFFICE FOR ANY DETAILS/QUESTIONS REGARDING PROPER INSTALLATION)

ALL LOOSE DIRT/ROCKS MUST BE REMOVED PRIOR TO POURING THE FOUNDATION FOOTERS AND PADS

General Notes

1. THE SPECIFICATIONS, SOILS REPORT, AND OPEN HOLE LETTER ARE PART OF THIS DESIGN.
2. VERIFY LOCATION OF PADS.
3. LOAD BEARING COMPONENTS SUSCEPTIBLE TO THE WEATHER SHALL BE FINISHED TO A MINIMUM OF 30" BELOW AND 6" ABOVE FINISHED GRADE.
4. FOOTER, PAD, AND PIER SIZES SHOWN ON THIS DESIGN ARE MINIMUM AND MAY BE UP SIZED.
5. PADS 18" SQ THRU 22" SQ ARE 7.5" THICK, PADS 24" SQ THRU 34" SQ ARE 9.5" THICK AND PADS 36" SQ THRU 54" SQ ARE 11.5" THICK. SEE DETAIL SHEET FOR ADDITIONAL INFORMATION.
6. WALL THICKNESSES SHOWN ARE NOMINAL. WALL HEIGHTS VARY, REFER TO ARCHITECTURAL DRAWINGS AND DETAIL SHEETS.
7. IF WALL HEIGHTS EXCEED 10 FEET, OR IF ANY UNFORESEEN CONDITIONS ARISE, CONTACT THE ENGINEER.
8. REFER TO DETAIL SHEETS FOR REINFORCEMENT SCHEDULE AND ADDITIONAL INFORMATION.
9. BLOCK-OUTS FOR BEAM POCKETS AND DOORWAYS ARE REQUIRED. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS AND SIZES.
10. PLACE THE CONCRETE SLAB OR OTHER SUITABLE LATERAL RESTRAINT, IN ADDITION TO FLOOR JOISTS AND SUBFLOOR, PRIOR TO BACKFILLING.
11. PLACE AND COMPACT BACKFILL IN LIFTS ALONG ENTIRE LENGTH OF WALL. SEE SPECIFICATIONS.

FOUNDATION DESIGN:

1,500 PSF (GEOQUEST #17-0199) OVERDIG
SPECIAL SOILS EXIST – SEE SOILS REPORT
PROVIDE COPY OF OPEN HOLE REPORT TO MIBAR.
SOIL BEARING MUST BE 1,500 PSF OR HIGHER FOR THIS FOUNDATION DESIGN TO BE VALID.

No.	Revision/Issue/Change	Date
1.	Corrected address per builder	5/17/18
2.	Shortened buttress walls for lot lines	7/10/18

MIBAR ENGINEERING LTD., LLC
6825 SILVER PONDS HEIGHTS
SUITE 101
COLORADO SPRINGS, CO 80908

MIBAR ENGINEERING

OFFICE: (719) 487-0812
FAX (719) 481-9204

COLORADO LICENSED
MOLLY S. LUCE
7/10/18
43835
PROFESSIONAL ENGINEER

Project: 17095	Project Name and Address
Sheet: 2 of 3	CASCADE BUILDERS
Date: 4/21/17	
Scale: 1/8"=1'	
Drawn by: RPJ	1907 WEST CUCHARRAS STREET
Checked by: MSL	EL PASO COUNTY, COLORADO

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

July 20, 2018

Cascade Builders
P.O. Box 462
Cascade, Colorado 80809

Re: Open Hole Observation (GQ#17-0200)
Lot #1,
1907 West Cucharras Street Sub,
EL Paso County, Colorado

Dear Sir,

The Over-Excavation Scheme required in the soils report is here-by rescinded.

It was observed on July 10, 2018, that all materials encountered during the excavation at the above referenced site hold no significant variation from the silty sand (SM) materials encountered during the drilling for the Soils Report by Geoquest LLC, Job #17-0200, dated March 16, 2017. No piers were present at the time of inspection.

No anomalies, soft spots, or debris are present in the foundation area. All loose material in the foundation forms must be removed and concrete placed on the native material.

The maximum allowable bearing capacity on this site is not greater than **1,500 pounds per square foot** as stated in the Soils Report.

Perimeter drains are required around all walls of the usable area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Walkout area need not be drained unless specified.

Concrete shall not be placed into forms containing water or mud. Any water or mud that has collected in the foundation forms shall be removed from the forms prior to the placement of concrete. Reinforcing for concrete foundation shall be as per the engineered design.

Sincerely,

Charles E. Milligan, P.E.
Civil Engineer

COLORADO REGISTERED
CHARLES E. MILLIGAN
34608
PROFESSIONAL ENGINEER
7/20/18

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

FOR

CASCADE BUILDERS

Job *#17-0200*

Lot 1,
1907 West Cucharras Street Sub,
El Paso County,
Colorado

Respectfully submitted,

COLORADO REGISTERED
CHARLES E. MILLIGAN
34608
15 JUL 18
PROFESSIONAL ENGINEER

Re-Issue

Charles E. Milligan, P.E.
Civil Engineer

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

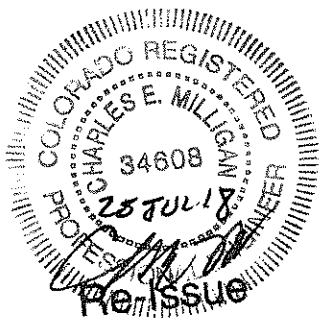
FOR

CASCADE BUILDERS

Job *#17-0200*

Lot 1,
1907 West Cucharras Street Sub,
El Paso County,
Colorado

Respectfully submitted,



Charles E. Milligan, P.E.
Civil Engineer

TABLE OF CONTENTS

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report please contact us. It is the responsibility of the contractor on this project to make subsequent home owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Cascade Builders, builder on Lot 1, 1907 West Cucharras Street Sub, El Paso County, Colorado.** It is my understanding that a single-family residence is planned for this site. The site is currently vacant.

CONCLUSIONS

This Over-Excavation Scheme may be revised or rescinded pending the results of the Open Hole Observation.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on over-excavated and replaced materials. **On site material may be used for this over-excavation if compaction requirements can be met.** This over-excavation and replaced materials scheme is necessary due to the high expansive on site material. This over-excavation and replaced materials scheme will reduce, but not eliminate the potential for movement with moisture fluctuations in the unstable subgrade soils. Since those materials will remain in-place beneath the fill, a potential remains that moisture changes in these deeper unstable materials will cause some movement in the overlying fill and structure. This material has an expansion potential of approximately **5.2% per foot depth with a swell force of 11000 pounds per square foot.** The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the location of the foundation walls. It may be necessary to place approximately 1-2 feet of 4-12 inch diameter ballast rock in the bottom of the excavation to stabilize the native soil material. The material to be compacted in the excavation shall meet or exceed El Paso County Road Base Materials specifications. This material shall be compacted to a minimum of 95% of its modified Proctor density. **Proctor testing will be required on a sample of the replacement material to be used for this over-excavation scheme. A 5 gallon valid sample of the soil to be used, must be provided for testing (unless a previous proctor test can be provided) at least 7 days prior to the placement and compaction of the material.** The compressibility of the over-excavated and replaced material shall be taken to be low. A maximum allowable bearing capacity for the over-excavated and replaced material is a presumptive value of **1500 pounds per square foot.** This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The minimum depth for foundation walls shall be 30 inches for frost protection. **The laboratory testing revealed that the on-site soil is low plasticity clay with underlying silty sand (U.S. Classification Symbol CL, SM). The unit weight of equivalent fluid soil pressure of this material is 100 (CL), 40 (SM) pounds per cubic foot.** The owners shall be made aware that movement will definitely occur if surface or subsurface water is allowed to collect around or in the over-excavated area.

GENERAL

The investigation was made to reveal important characteristics of the soils and of the site influencing the foundation design. Also evaluated during the investigation were subsurface conditions which affect the depth of the foundation and subsequent loading design, such as ground water levels, soil types, and other factors which affect the bearing capacity of the soils. Design loadings are based on soils characteristics and represent the maximum permissible loads for these conditions.

FIELD AND LABORATORY INVESTIGATION

Two exploratory holes were drilled on March 16, 2017, at the locations shown on the enclosed site map. The location of these test holes was determined by Cascade Builders. The test holes were drilled with a 3-inch diameter auger. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed and samples were taken by the use of a 2.5-inch "split barrel" sampler connected to a 140 pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil **(ASTM D-1586)**. The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed log sheets. All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered.

TOPOGRAPHY

The topography of this site is flat.

WEATHER

The weather at the time of the soil examination consisted of mostly cloudy skies with warm temperatures.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Residential basement slabs-on-grade may move and crack. Vertical slab movement of one to three inches is considered normal for soils of low to moderate expansion potential and for compacted structural fill after removal of high expansive soils. In some cases vertical movement may exceed this range. If movement and associated damage to basement floors and finish cannot be tolerated, a structural floor system shall be installed. The native materials encountered during the exploratory testing are not suitable for the support of residential construction. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Personnel of Geoquest LLC, shall inspect the base of the over-excavation prior to any placement of any fill materials. All backfill material and over excavated and replaced material shall be properly tested by Geoquest LLC, at the time of installation of said material. Soil located beneath concrete walls and floors shall be compacted to at least 95% Modified Proctor density. Other backfill materials shall be compacted to at least 85% Modified Proctor density.

DESIGN AND CONSTRUCTION CONSIDERATIONS (CONTINUED)

Special care is to be taken to re-compact the material above utility lines to a minimum of 90% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls shall be constructed such that they do not transmit floor slab movement to the roof or overlying floor. The gap or void (1.5" min.) installed in these non-bearing partitions may require re-construction over the life of the structure to re-establish the gap or void to allow for vertical slab movement. Stairwells, doorways and sheeted walls should be designed for this movement. The following are general recommendations of on-grade slabs:

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above. Exterior concrete shall slope away from the structure the same amount as requirements of soil.

2. Separate the slab from all foundation walls, load bearing members, and utility lines.

3. At intervals, not to exceed 12 feet in each direction, provide control joints to prevent possible cracking of the slab.

4. Moisten the ground beneath the slab prior to placement of concrete.

5. All concrete placed must be cured properly and be segregated by control joints and with separation of load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 24 inches of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement.

7. **The low plasticity clay has been tested for its expansion and/or consolidation potential. This material has a 5.2% expansion potential with a dead load of 11000 pounds per square foot.** Basement slabs, garage slabs, and all concrete floor slabs, exert a very low dead-load pressure on the soil. Since this soil contains a high amount of swell potential, slabs will crack and heave or settle if excess water is allowed to penetrate the subgrade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the subgrade, possibly causing it to expand. Also, if the slab is placed with concrete too wet, expansion may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

The recommendations provided in this report are based upon the observed soil parameters, anticipated foundation loads and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soil or from the settlement induced by the application of loads. **It must be recognized that the foundation will undergo some movement on all soil types.** In addition, concrete floor slabs will move vertically, therefore, adherence to those recommendations which isolate floor slabs from columns, walls, partitions or other structural components is extremely important, if damage to the superstructure is to be minimized. Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage and partition framing, drywall and finish work above floor slabs.

Geoquest LLC does not assure that the contractor or homeowner will comply with the recommendations provided in this report. Geoquest LLC provides recommendations only and does not supervise, direct or control the implementation of the recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon frozen soil.

2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.

3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.

4. Concrete shall be cured in forms for at least 72 hours.

5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. The site shall be kept well drained at all times.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 80% Modified Proctor density, to prevent future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. The finished grade shall have a positive slope away from the structure with an initial slope of 12 inches in the first 10 feet. All downspouts shall extend across the excavated area and have splash blocks that will remove runoff beyond the foundation and excavated area.

SURFACE DRAINAGE (CONTINUED)

Likewise, sprinkler systems shall not be installed adjacent to the structure, and shrubs and plants requiring only minimal watering may be established in this area. All exterior grading and location of downspouts and their performance shall be inspected by Geoquest, LLC. **The native low plasticity clay (CL) material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** It is the responsibility of the contractor to schedule all inspections. Also, the backfill material shall consist of road base material as described previously.

SUBSURFACE DRAINAGE

Perimeter drains are required to be installed around the entire structure. The drains shall be taken to daylight if grade allows. The location of this daylight for the drain system shall be acknowledged by the homeowner and subsequent homeowners. These daylights shall be maintained and kept functional during all stages of the project.

REINFORCING

The concrete foundation walls shall be properly reinforced as per the specific design for this foundation by a Professional Engineer. Exact requirements are a function of the design of the structure. Questions concerning the specific design requirements shall be referred to the Design Engineer.

FOOTING DESIGN

The design for footings for this structure is determined by applying the dead load and full live load to the foundation walls.

CONSTRUCTION DETAILS

It is necessary with any soils investigation to assume that the materials from the test holes are representative of the materials in the area. On occasion variations in the subsurface materials do occur, therefore, should such variations become apparent during construction, the owner is advised to contact this office for a determination as to whether these variations will affect the design of the structure's foundation. If anomalies are observed during the excavation for the dwelling, this office should be contacted to determine whether this may adversely affect the design.

MINIMUM MATERIALS SPECIFICATIONS

1. Minimum materials specifications of the concrete, reinforcing, etc., shall be determined by the Professional Engineer.

2. Compact beneath foundation walls a minimum of 95% Modified Proctor density to prevent settlement.

MINIMUM MATERIALS SPECIFICATIONS (CONTINUED)

3. Compact all backfill material located around the perimeter of the foundation to 80% Modified Proctor density.

4. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

5. The site shall be kept well drained at all times.

OPEN HOLE OBSERVATION

If anyone other than Geoquest performs the Open Hole Observation and/or compaction testing, that person/company assumes liability for the soils, and any possible changes to the foundation design.

The owner, or a representative of the construction, shall contact Geoquest, LLC **24 hours prior to digging** of the foundation. An open hole observation must be performed prior to the placement of replaced materials. All inspections shall be performed described herein.

FINAL OBSERVATIONS

The owner, or a representative of the construction, shall contact Geoquest, LLC at the time final grading and landscaping procedures are completed. This is to insure that sprinkler systems are not installed adjacent to the structure and that only shrubs or plants that require minimal watering are established in this area. All exterior grading as well as the location of downspouts and their performance shall be inspected by Geoquest, LLC. Any additional landscaping or grading changes performed by subsequent contractors and/or owners shall be inspected and approved. It is the responsible of the contractor and/or owner to schedule all these inspections at the appropriate times.

GEOQUEST, inc
461-4560

DRILL LOGS

JOB #: 17-0200

TEST BORING
NO.: TH-1

DATE: 3/16/2017

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
0"-9' Fill					
Fine-coarse grained Low density Low moisture content Moderate clay content Moderate plasticity Brown color Debris 6'-10'			4 12"	4.2	
9'- 11' Sand (SM)					
Fine-coarse grained Moderate density Low moisture content Low clay content Low plasticity Light Brown color Cobbles Drill Refusal @ 11'			Bag 12"	3.7	SM

JOB #: 17-0200

TEST BORING
NO.: TH-2

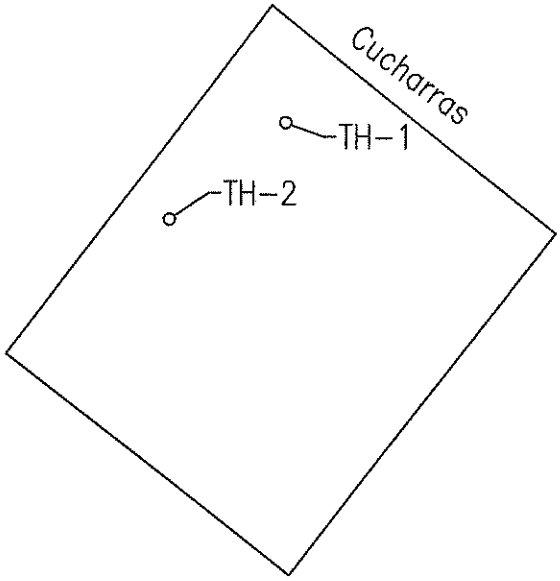
DATE: 3/16/2017

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
0"-7' Clay (CL)					
Fine grained Moderate density Moderate-high moisture content Low sand content High plasticity Brown color			20 12"	15.4	CL
7'- 9' Sand					
Fine-coarse grained Moderate density Low-moderate moisture content Low clay content Low plasticity Light Brown color Cobbles Drill Refusal @ 9'			Bag 12"	4.4	

GEOQUEST LLC

SITE MAP

Lot 1
1907 W Cucharras St Sub,
El Paso County,
Colorado
Job #17-0200

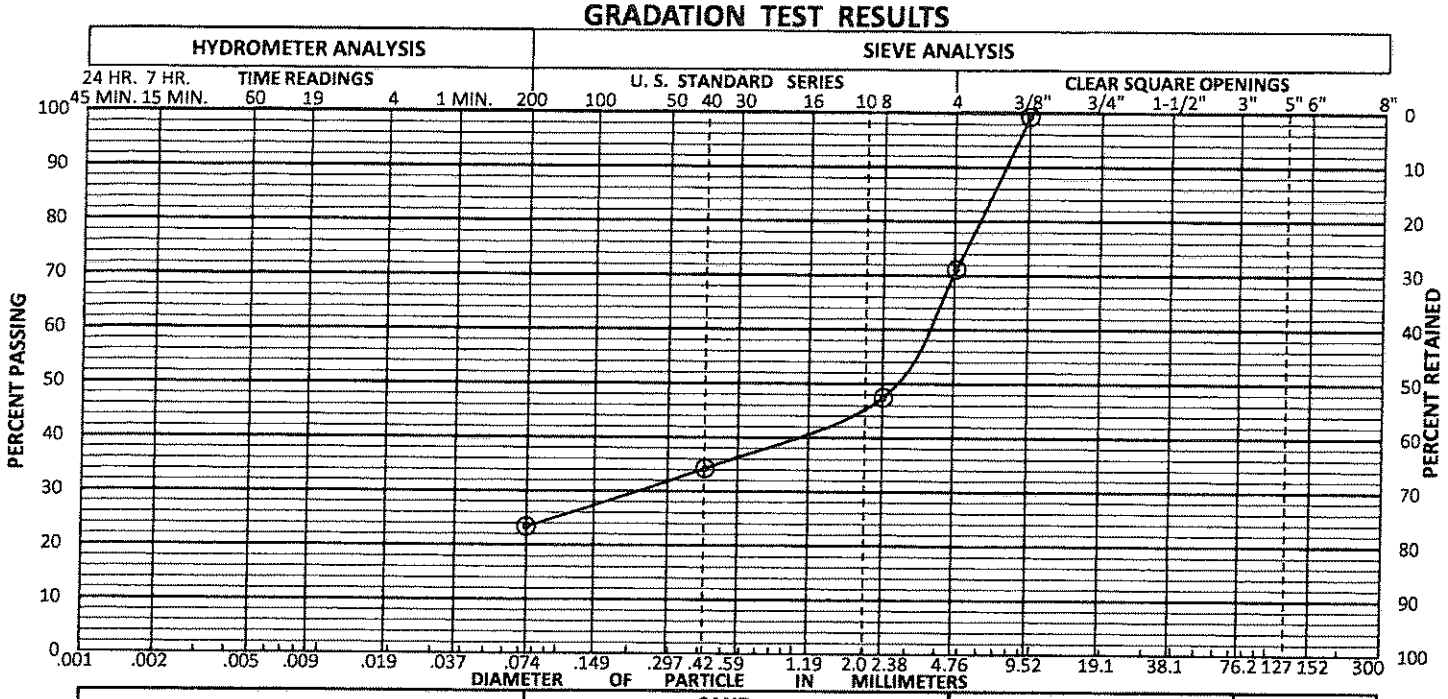


N

0 10 20 30 40 50
GRAPHIC SCALE IN FEET
SCALE: 1" = 50'

GEOQUEST LLC

GRADATION TEST RESULTS



CLAY TO SILT	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

CLASSIFICATION SM

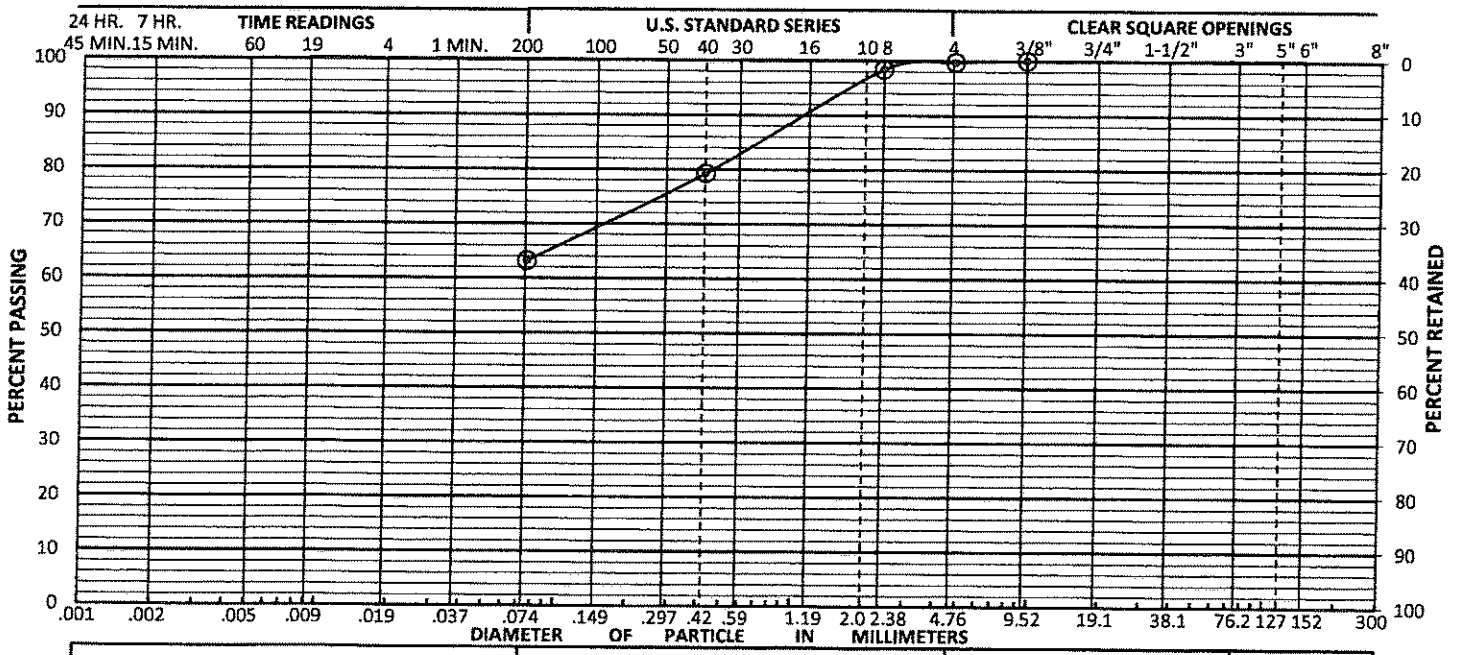
GRAVEL 28.9 %

SAND 47.7 %

FINES 23.4 %

SAMPLE # 1 HOLE # TH-1 DEPTH 11 FEET

NOTES: 3.7 % Moisture Content



CLAY TO SILT	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

CLASSIFICATION CL

GRAVEL 0.3 %

SAND 36.5 %

FINES 63.2 %

SAMPLE # 1 HOLE # TH- 2 DEPTH 4 FEET

NOTES: 15.4 % Moisture Content

LL = 41.5

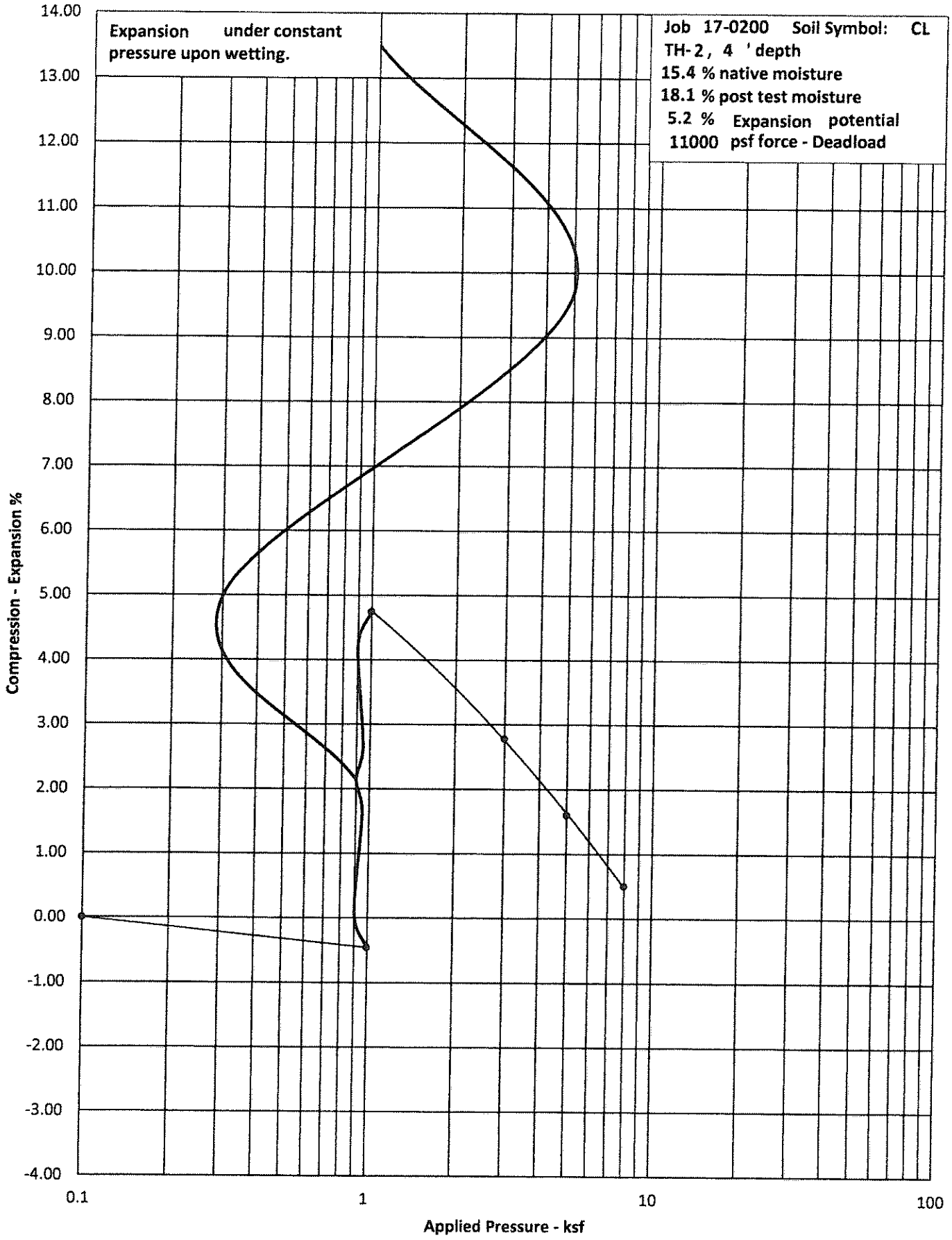
PL = 23.4

PI = 18.1

Job #: 17-0200 By: MJ 3/16/2017

GEOQUEST LLC

SWELL-CONSOLIDATION TEST RESULTS

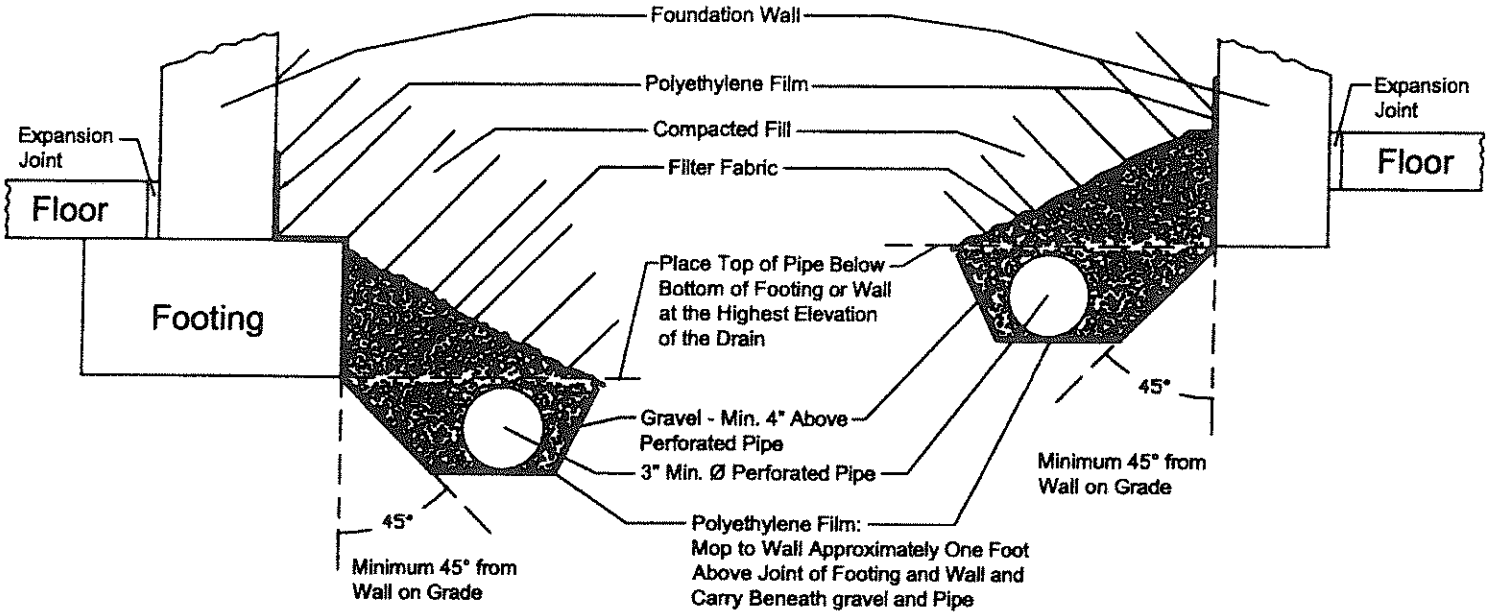


GEOQUEST, LLC
481-4560

EXTERIOR DRAIN DETAIL

SPREAD FOOTING TYPE

WALL ON GRADE TYPE



1. Gravel to be Not More Than 1-1/2" and Not Less Than 1/2" Diameter.

2. Perforated Pipe Diameter Varies With Expected Seepage. 3"Ø and 4"Ø are Most Common. ABS and PVC are Most Common Materials for Pipe.

3. Pipe to be Laid out in a Minimum Slope of 1" in 10'.

4. Gravity Outfall is Desired if Possible. Portion of Pipe in Area Not Drained Shall be Non-Perforated. Daylight Must be Maintained Clear of Debris in Order to Function Properly.

5. If Gravity Outfall is Not Possible, Provide a Sump With Operational Pump. Pump May Not Connect to Any Sanitary or Storm Sewer.

6. Soil Backfill Should be Compacted to at Least 80% of the Modified Proctor Denisty in the Upper Three Feet of Fill.

7. Filter Fabric to be Mirafi 140s or Approved Equivalent. Roofing Felt and Sheet Plastic are Not Acceptable.

8. Drain Pipe Shall be Laid Below Protected Area, as Shown in The Detail Above.

9. Mop Polyethylene Film to Wall Approximately One Foot Above Joint of Footing and Wall and Carry Beneath Gravel and Pipe.

10. The Polyethylene Film Shall be Continued to the Edge of the Excavation.

LIMITATIONS

This report is issued based on the understanding that the owner or his representative will bring the information, data, and recommendations contained in this report to the attention of the project engineer and architect, in order that they may be incorporated into the plans for the structure. It is also the owner's responsibility to ensure that all contractors and sub-contractors carry out these recommendations during the construction phase.

This report was prepared in accordance with generally accepted professional geotechnical/engineering methods. However, Geoquest, LLC makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder.

This report is considered valid as of the present date. The owner acknowledges, however, that changes in the conditions of the property might occur with the passage of time, such as those caused by natural effects or man-made changes, both on this land and on abutting properties. Further, changes in acceptable tolerances or standards might arise as the result of new legislative actions, new engineering advances, or the broadening of geotechnical knowledge. Thus certain developments beyond our control may invalidate this report, in whole or in part.

This report and its recommendations do not apply to any other site than the one described herein and are predicated on the assumption that the soil conditions do not deviate from those described. In the event that any variations or undesirable conditions should be detected during the construction phase or if the proposed construction varies from that planned as of this report date, the owner shall immediately notify Geoquest, LLC in order that supplemental recommendations can be provided, if so required.