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for Soils and Geology  
report information

**SOILS REPORT**  
  
**FOR**  
  
**RICK YARBROUGH**

**JOB #14792**

S-1/2, SE-1/4, Section 9,  
TS 11 S, Range 67 West of the 6<sup>th</sup> PM,  
Rock Brook Road,  
El Paso County,  
Colorado

Respectfully submitted,

A handwritten signature in blue ink that reads "Jeff Houchin".

Jeff Houchin  
Geologist



Michael F. Reynolds, P.E.  
Civil Engineer

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## INTRODUCTION

Homeowners must be made aware of the contents of this report. This is to insure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Rick Yarbrough, purchaser or owner of the S 1/2, SE 1/4, of Section 9, TS 11 South Range 67 West of the 6<sup>th</sup> PM, Rock Brook Road, El Paso County, Colorado.** It is my understanding that a single family residence is planned for this site. The site is currently vacant.

## CONCLUSIONS

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **2000 pounds per square foot**. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **4500 pounds per square foot**. The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer, but should be at least as deep as the minimum depth required by the governing building authority. The laboratory testing revealed that the on-site soil is clayey sand (U.S.C. Classification Symbol SC). The unit weight of equivalent fluid soil pressure of this material is 45 pounds per cubic foot. **The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

which one?

## 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 that 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 February 27, 2006, at the locations shown on the enclosed site map. The location of these test holes was determined by Rick Yarbrough. 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-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 that of an incline sloping down towards the west at 16%.

## WEATHER

The weather at the time of the soil examination consisted of partly cloudy skies, with cool temperatures.

## DESIGN AND CONSTRUCTION CONSIDERATIONS

The materials encountered during the exploratory testing are suitable for the support of residential construction. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Soil located beneath concrete walls and floors shall be compacted to at least 95% Modified Proctor density. Special care is to be taken to recompact the material above utility lines to a minimum of 85% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls **shall be free-floating** or independent from the concrete floor slab. 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.
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.
6. The soil has been analyzed for its expansion potential. Basement slabs, garage slabs, and all concrete floor slabs, however, exert a very low dead-load pressure on the soil. Since this soil contains at least a small amount of expansion potential, slabs will crack and heave 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.

### **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. 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 which 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 6" in the first 10'. All downspouts shall have splash blocks that will remove runoff to outside the foundation area. Likewise, sprinkler systems shall not be installed adjacent to the structure, but rather shrubs and plants requiring minimal watering shall be established in this area.

### **SUBSURFACE DRAINAGE**

The necessity for perimeter drains will be determined at the time of the Open Hole Observation.

### **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 clay layers are observed during the excavation for the dwelling, this office should be contacted to determine whether the layers will 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.
3. Compact all backfill material located around the perimeter of the foundation to a minimum of 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 (added cost)

The owner, or a representative of the construction, shall contact Front Range Geotechnical, Inc. 24 hours prior to digging of the foundation. An open hole observation must be performed on each individual structure prior to the placement of concrete, and preferably prior to the placement of forms in the excavated area. The failure to request or obtain an Open Hole Observation prior to the placement of foundation components may result in this Soils Report being declared null and void. This is to insure that soft areas, anomalies, etc., are not present in the foundation region. At the time of the open hole observation the foundation type recommendations, maximum allowable bearing capacity may be revised according to soil conditions found at that time. If revisions are made to the Soils Report Due to the soil conditions of the excavation, the Foundation Design Engineer must be notified of all revisions.



**FRONT RANGE  
GEOTECHNICAL  
INC.**

# DRILL LOGS

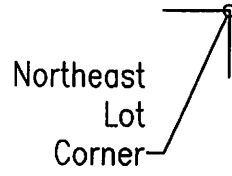
| JOB#: 14792             | DEPTH (in ft.) | SYMBOL | SAMPLES | BLOW COUNT | WATER % | SOIL TYPE |
|-------------------------|----------------|--------|---------|------------|---------|-----------|
| TEST BORING NO.: TH-1   |                |        |         |            |         |           |
| DATE: 02/27/2006        |                |        |         |            |         |           |
| 0"-4" <u>TOPSOIL</u>    | 0-4            | XXXX   |         |            |         |           |
| 4"-3' <u>SAND</u>       | 4-12           | ////   |         |            |         |           |
| fine-course grained     |                |        |         |            |         |           |
| low-mod density         |                |        |         |            |         |           |
| low moisture content    |                |        |         |            |         |           |
| low clay content        |                |        |         |            |         |           |
| low plasticity          |                |        |         |            |         |           |
| tan color               |                |        |         |            |         |           |
| cobbles throughout      |                |        |         |            |         |           |
| 3'-15' <u>SANDSTONE</u> | 10-15          | ////   |         |            |         |           |
| fine-med grained        |                |        |         |            |         |           |
| moderate density        |                |        |         |            |         |           |
| low moisture content    |                |        |         |            |         |           |
| low clay content        |                |        |         |            |         |           |
| low plasticity          |                |        |         |            |         |           |
| tan color               |                |        |         |            |         |           |
| slightly oxidized       |                |        |         |            |         |           |
|                         |                |        |         | 36<br>12"  | 8.6     | SC        |
|                         |                |        |         | 40<br>6"   | 8.3     |           |

| JOB#: 14792              | DEPTH (in ft.) | SYMBOL | SAMPLES | BLOW COUNT | WATER % | SOIL TYPE |
|--------------------------|----------------|--------|---------|------------|---------|-----------|
| TEST BORING NO.: TH-2    |                |        |         |            |         |           |
| DATE: 02/27/2006         |                |        |         |            |         |           |
| 0"-6" <u>TOPSOIL</u>     | 0-6            | XXXX   |         |            |         |           |
| 6"-10' <u>SAND</u>       | 6-10           | ////   |         |            |         |           |
| fine-med grained         |                |        |         |            |         |           |
| moderate density         |                |        |         |            |         |           |
| low moisture content     |                |        |         |            |         |           |
| low clay content         |                |        |         |            |         |           |
| low plasticity           |                |        |         |            |         |           |
| tan color                |                |        |         |            |         |           |
| 10'-15' <u>SANDSTONE</u> | 10-15          | ////   |         |            |         |           |
| fine-med grained         |                |        |         |            |         |           |
| high density             |                |        |         |            |         |           |
| low moisture content     |                |        |         |            |         |           |
| low clay content         |                |        |         |            |         |           |
| low plasticity           |                |        |         |            |         |           |
| tan color                |                |        |         |            |         |           |
| slightly oxidized        |                |        |         |            |         |           |
|                          |                |        |         | 20<br>12"  | 4.7     |           |
|                          |                |        |         | 32<br>6"   | 7.8     | SC        |



**FRONT RANGE GEOTECHNICAL INC.**  
**SITE MAP**

S-2, SE-4, SECT 9-11-67,  
Rock Brook Road,  
El Paso County,  
Colorado  
Job #14792



TH-1-○

○-TH-2



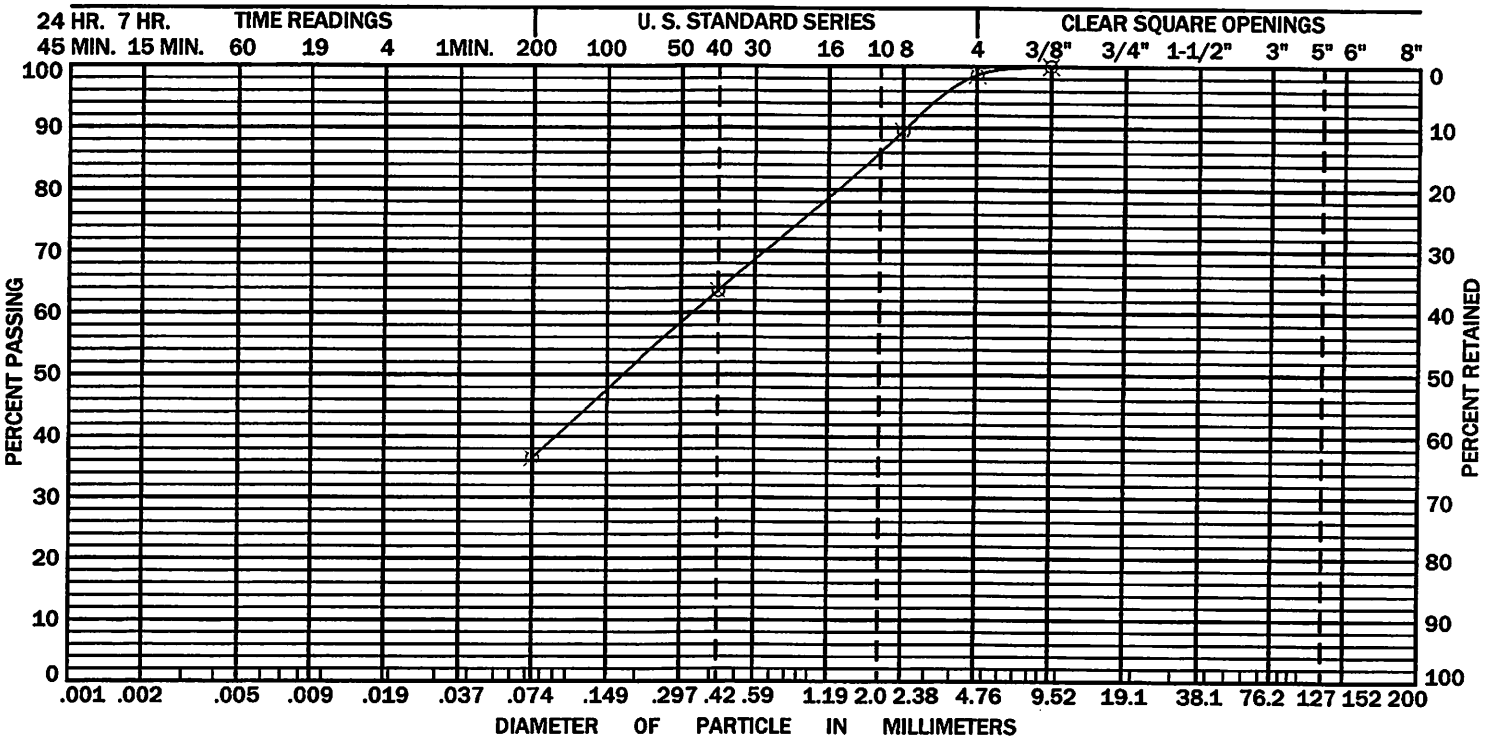
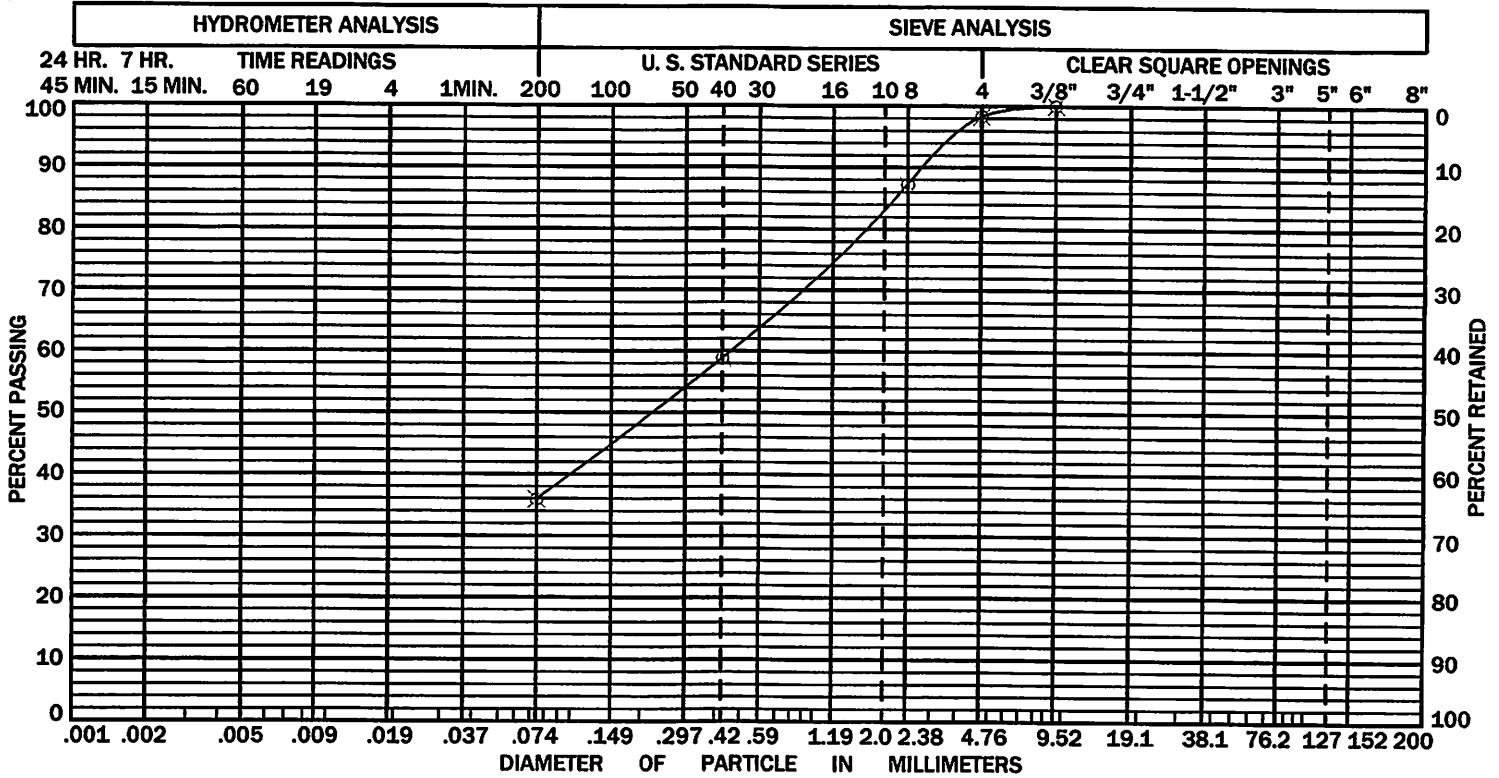
0 10 20 30 40 50  
GRAPHIC SCALE IN FEET  
SCALE: 1" = 50'



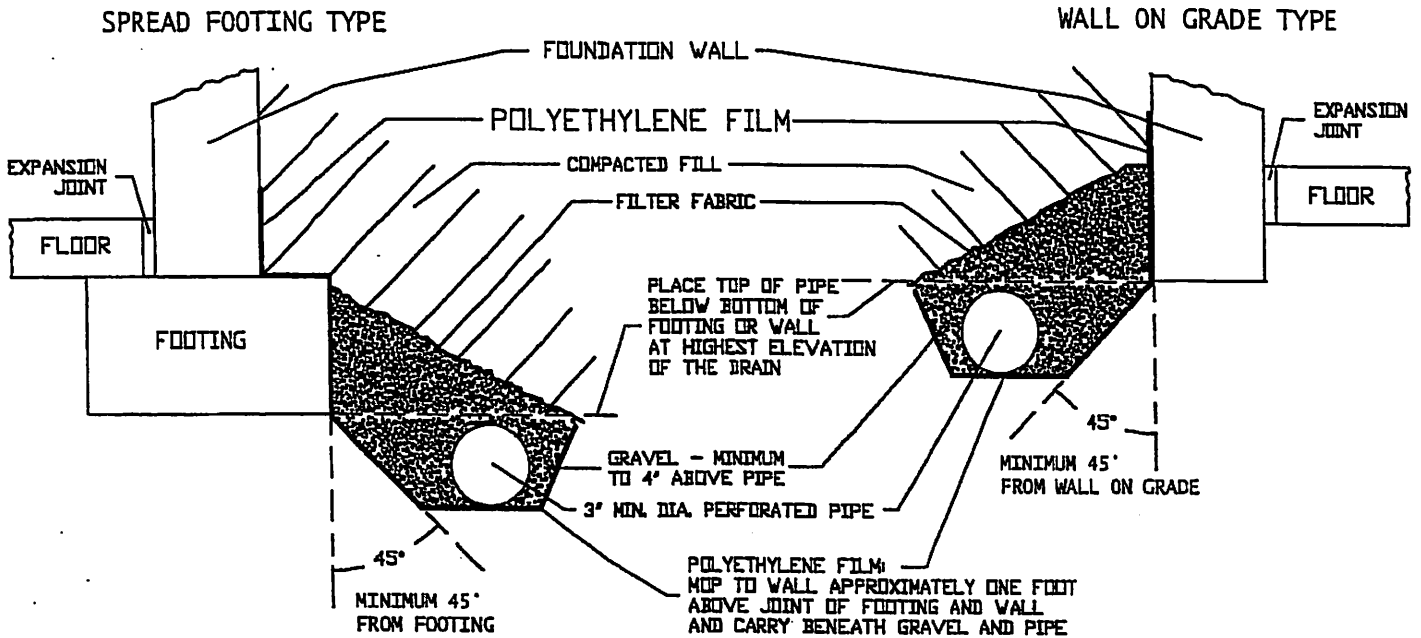


# FRONT RANGE GEOTECHNICAL INC.

## GRADATION TEST RESULTS



|   |  |  |           |  |            |  |
|---|--|--|-----------|--|------------|--|
| SAMPLE# <u>2</u> HOLE# <u>TH-2</u> DEPTH <u>10</u> FEET |  |  |           |  |            |  |
| Job: #14792   |  |  | By: Klore |  | 02/28/2006 |  |



1. Gravel size shall not be less than 1/2" in diameter and not greater than 1-1/2" in diameter.
2. Diameter of perforated pipe varies with amount of seepage expected, three inch diameter is most common.
3. Pipe shall be laid at a minimum grade of 1" in 10'.
4. Outfall to be unobstructed, gravity outfall if possible. Discharge portion of pipe shall be non perforated past area to be drained. Owner is responsible to maintain daylighting of drain.
5. If gravity outfall is not possible, a sump pit with an operational pump must be installed.
6. Exterior earth backfill material should be compacted to at least 30 % maximum modified Proctor density in the upper three feet of fill.
7. Filter fabric shall be mirafi 140 s or equivalent. Roofing felt is not acceptable.
8. Drain pipe shall be laid below area serviced or protected, 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, Front Range Geotechnical, Inc. 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 Front Range Geotechnical, Inc. in order that supplemental recommendations can be provided, if so required.

# Markup Summary

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