19-MSUB-0012

GREENBAUM ASSOCIATES, INC.
GEOTECHNICAL & MATERIALS ENGINEERS

994 Longfield Avenue
Louisville, Kentucky 40215
502/361-8447
FAX 502/361-4793

October 29, 2019

Mr. Jim Mims
Elite Homes, Inc
16218 Shelbyville Road
Louisville, KY 40245

SUBJECT: SLOPE RECONNAISSANCE
FISCHER FARM
SCHULER LANE
PROSPECT, KENTUCKY
PROJECT NUMBER 19-241G

Dear Mr. Mims:

Attached are the results of a site reconnaissance and geological research related to the proposed residential construction at the above referenced subdivision. These recommendations include discussion of benching into existing slopes for fill placement, trimming slopes, etc. There is no evidence of slope instability anywhere across the site.

If you have any questions in regard to these recommendations, please call.

Sincerely,

GREENBAUM ASSOCIATES, INC.

Sandor R. Greenbaum

Digitally signed by Sandor R. Greenbaum
DN: cn=Sandor R. Greenbaum, o=Greenbaum Associates, Inc., ou, email=srg@geo-engineers.com, c=US
Date: 2019.10.29 13:28:13 -04'00'

Sandor R. Greenbaum, P.E.
Principal Engineer

19-MSUB-0012

SLOPE RECONNAISSANCE

FOR

FISCHER FARM

SCHULER LANE

PROSPECT, KENTUCKY

FOR

ELITE HOMES, INC.

16218 SHELBYVILLE ROAD

LOUISVILLE, KY 40245

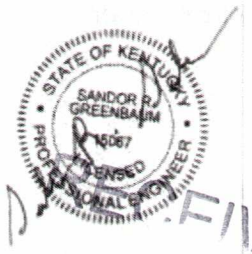
BY

GREENBAUM ASSOCIATES, INC.

994 LONGFIELD AVENUE

LOUISVILLE, KENTUCKY 40215

OCTOBER 29, 2019



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APPENDIX

1.0 Introduction

Elite Homes, Inc. is in the process of designing a new residential subdivision, Fischer Farm, to be constructed on a portion of a ±215-acre parcel located off Schuler Lane in Prospect, Kentucky. This investigation is directed at the portion of the property to be located in Jefferson County, about 191 acres. However, much of this acreage, the western and northern portion, is to remain undeveloped greenspace. Most of the portion of this property to be developed is relatively level, but elevations drop to the north, south and west of the proposed development.

- Lots 59 through 68 are not bordered by significant slopes.
- Lots 69 through 79 are on slopes of 5 percent or less and border slopes of 10 percent or less.
- Lots 80 through 82 are on lots sloping less than 5 percent and are at least 100 feet away from steeper slopes.
- Lots 83 through 87 are on lots sloping less than 5 percent and borders an area with a slope approaching 20 percent.
- Lots 88 through 102 are on lots with slopes up to 15 percent.
- Lots 103 through 106 are on lots that have slopes less than 5 percent and border slopes of about 10 percent.
- Lots 107 through 111 are on lots that slope up to 10 percent and border slopes of up to 20 percent.
- Lots 112 through 126 and 152 through 167 are on lots that slope less than 5 percent and border slopes of up to 10 percent.
- Lots 127 through 151 are in the level interior of the development and have no significant slope nor do they border slopes.
- Lots 168 through 174 slope less than 5 percent and do not border areas of greater slope.

The relatively level areas that comprise most of the area to be developed is covered by turf and weeds, some knee-high and other areas are clear where sod has been harvested. The sloping areas around the perimeter of the area being developed and including portions of some lots on the outer perimeter is covered by woods with trees of significant age, some with trunks up to 12 inches in diameter, perhaps greater.

We were contracted by Elite Homes, Inc. to provide recommendations for dealing with construction on slopes, particularly those of 20 percent or greater. Work was coordinated through Mr. Jim Mims, P.E. of Elite Homes, Inc. and Mr. Kevin Young, Principal with Land Design & Development, Inc.

2.0 General Geology

Soils at this site are residuum, the residual product of weathering of the local bedrock. Bedrock below the portion of the site being developed as residential lots is the Louisville Limestone, in areas bordering slopes of the underlying Waldron Shale and older formations that underly it, including the Laurel Dolomite, Osgood and Brassfield Formations, and Drakes Formation, listed in order from top to bottom (younger to older). The attached drawing, taken from Kentucky Geological Survey mapping, illustrates the site geology.

The Kentucky Geological Survey describes the Louisville Limestone as:

> Dolomitic limestone and dolomite, yellowish gray to light olive gray, in quarry exposures interval more than 20 feet thick near top of lower half of unit has brownish cast; finely crystalline; argillaceous in zone about 15 to 20 feet above base; pyritic; thin to very thin bedded in upper part, thick bedded near base; bedding defined by stylolites; irregular rubbly bedding common; chert in discontinuous 0.2 foot thick layers in uppermost few feet. Prominent bench forming massive beds at about 35 feet and at 60 feet above base of unit, used in obtaining supplementary structural data. Fossils include brachiopods, among which Pentamerus is fairly common. in a layer about 20 feet above base, algal stromatolites, and corals; silicified remains of distinctive "chain" coral Halysites aids in distinguishing Louisville residual soils from those of overlying units. Unit thins irregularly northward from between 70 and 80 feet thick along south edge of quadrangle to between 40 and 45 feet along north edge, owing to truncation by pre Jeffersonville erosion. Contact with underlying unit abrupt to gradational through less than 1 foot. Sinks develop in unit on uplands.

The Kentucky Geological Survey describes the Waldron Shale as:

> Clay shale, dark greenish gray, weathers medium light gray, yellowish gray, to grayish yellow; silty, dolomitic, pyritic; contains rare pod like inclusions of dolomite as much as 3 feet thick and 6 feet wide in upper part; basal 1 foot increasingly dolomitic. Weathers to gentle slope on bench formed by resistant underlying unit. Average thickness about 10 feet.

Formations not immediately bordering the portion of the site being developed are not described here, since they do not affect the stability of the lots being developed.

3.0 Findings

3.1 Lots 59 through 68

These lots have no significant slope and, therefore, no concern of slope instability.

3.2 Lots 69 through 79

These lots are on slopes of 5 percent or less and border slopes of 10 percent or less. There is no evidence of slope movement, i.e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.3 Lots 80 through 82

These lots have no significant slope and, therefore, no concern of slope instability.

3.4 Lots 83 through 87

Lots 83 through 87 have slopes of less than 5 percent and border an area with a slope approaching 20 percent. There is no evidence of slope movement, i. e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.5 Lots 88 through 102

These lots are on slopes of up to 15 percent. There is no evidence of slope movement, i. e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.6 Lot 103 through 106

The area of lots 103 through 106 have slopes of less than 5 percent and border slopes of about 10 percent. There is no evidence of slope movement, i.e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.7 Lots 107 and 111

The area of lot 107 through 111 has lots that slope up to 10 percent and border slopes of up to 20 percent. There is no evidence of slope movement, i.e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.8 Lots 112 through 126 and Lots 152 through 167

These lots are on slopes of 5 percent or less and border slopes of 10 percent or less. There is no evidence of slope movement, i. e. no scarp, leaning trees consistent with a slide, erosion of the slope, tension cracks, etc.

3.9 Lots 127 through 151

These lots have no significant slope and, therefore, no concern of slope instability.

3.10 Lots 127 through 151

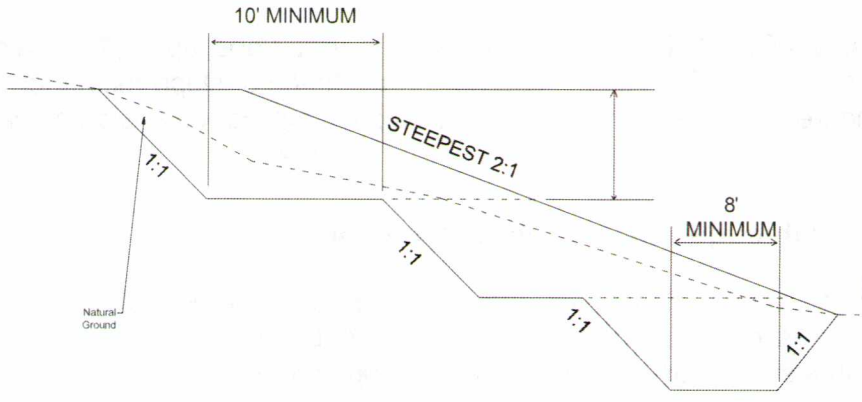
These lots have no significant slope and, therefore, no concern of slope instability.

3.11 Lots 168 through 174

These lots have slopes not exceeding 5 percent and do not border areas of greater slope, therefore, there is no concern of slope instability.

4.0 Site Preparation and Earthwork

The topography of this property is that of a relatively level plateau with slopes around it's northern, western and southern perimeter of up to about 20 percent, resulting in some significant cuts and fills. When fill is to be placed on an existing slope it is imperative that the existing slope be benched as shown in the diagram at the top of the following page to prevent the formation of a plane of weakness along which a slope failure can develop. Benching will have to be adjusted as necessary, in consultation with this office, where limestone bedrock is encountered that prevents benching as shown from being achieved. **Also, if fill extends down the slope onto areas underlain by Waldron Shale, benches will have to be cut into competent shale to ensure stability.**



All fill should be placed in lifts not exceeding 8 inches in uncompacted thickness and must be compacted to at least 98 percent of the soils maximum dry density as determined by the Standard Proctor (ASTM D-698). Soil moisture content should be within 2 percent of optimum as determined from the Standard Proctor.

Soil from any off-site borrow sources should be tested and approved by this office prior to being used on the site. Satisfactory borrow materials are those falling in one of the following classifications: GC, SM, SC, ML, or CL. Soil types MH, CH and OH soils and peat are unsatisfactory borrow materials.

The face of an inclined embankment cannot be compacted as densely as the interior fill because the outer slope deforms more elastically under load. This low-density zone tends to foster plant growth. Unfortunately, a heavy mat of vegetation is often formed with greater permeability than the underlying fill that can result in shallow slips of the vegetated surface downward. To prevent this from occurring one of three procedures must be followed in finishing the fill slope. These are: 1) trimming; 2) embedment of geotextile; or 3) emplacement of deep rooting woody vegetation.

Trimming requires that the fill be placed 18 inches beyond the final fill point. Once fill is complete the top 18 inches of soil must be bladed-off the slope to be removed for use as fill elsewhere.

Embedment of geotextiles requires that a woven-geotextile of uniaxial geogrid be placed vertically every two feet along the outer edge of the fill. This slope reinforcement must extend at least five feet in from the outer edge of the slope.

Soil fill must be no steeper than 2-horizontal to 1-vertical in order that it remain stable. Where there is a sharp angle in the slope, such as near the corner of a building or pavement corner, the slope must be no steeper than 2.5 to 1. If the slope is to be mowed with normal lawncare equipment, it should be no steeper than 3 to 1.

The placement of compacted fill should be carried out by an experienced excavator with the proper materials. The excavator must be prepared to adapt his procedures, equipment and materials to the type of project, to weather conditions, and the structural requirements of the engineer. Methods and materials used in summer may not be applicable in winter; soil used in proposed fill may require wetting or drying for proper placement and compaction. Conditions may also vary during the course of a project or in different areas of this site. These needs should be addressed in the project drawings and specifications.

During freezing conditions, the fill must **not** be frozen when delivered to the site. It also must not be allowed to freeze during or after compaction. Since the ability to work the soil while keeping it from freezing depends in part on the soil type, the specifications should require the contractor to submit a sample of his proposed fill before construction starts, for laboratory testing. If the soil engineer determines that it is not suitable, it should be rejected. In general, silty sand, clayey sand, and cohesive/semi-cohesive soils should not be used as fill under freezing conditions. All frozen soil of any type should be rejected for use as compacted fill.

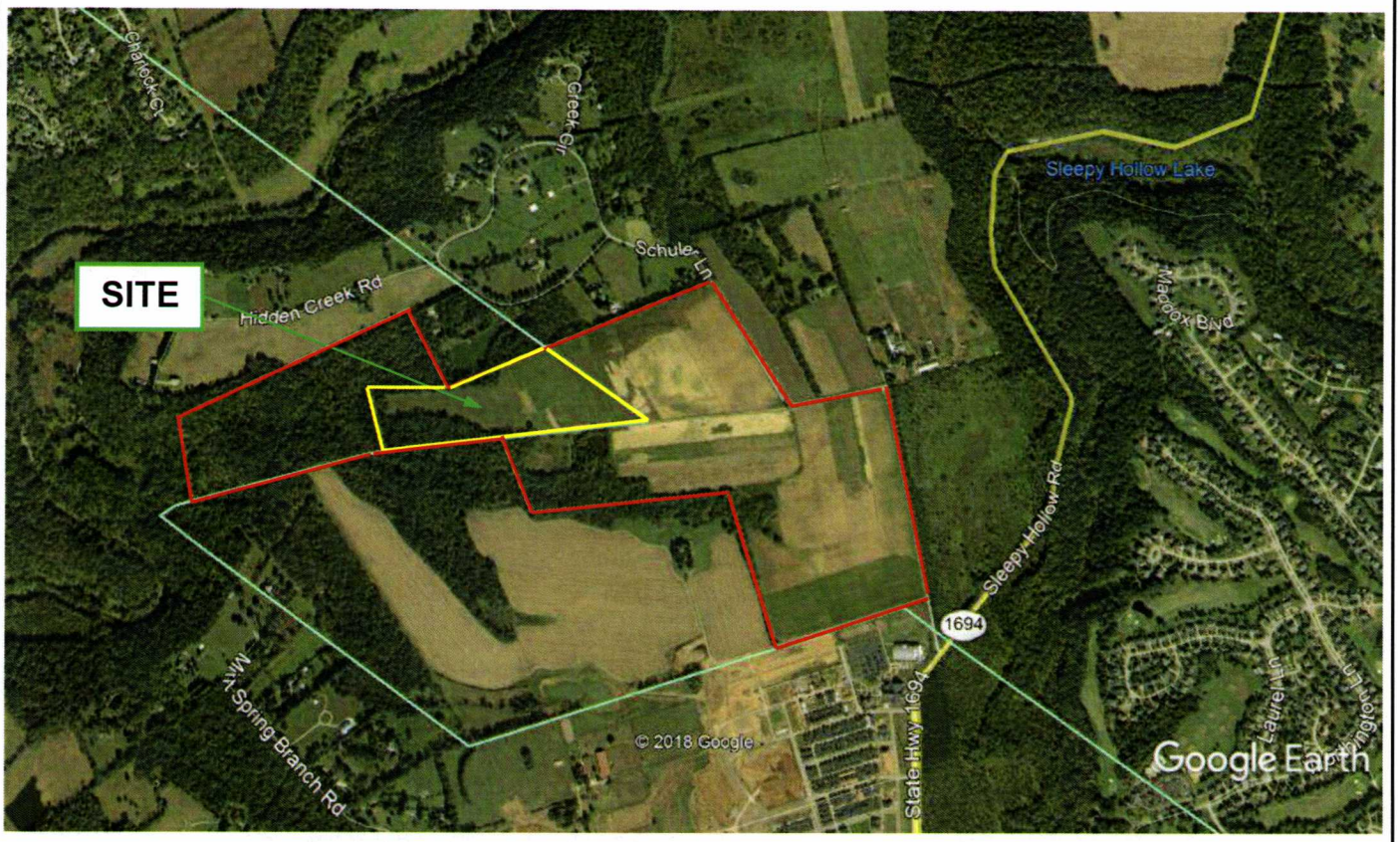
It is important that compacted fill be protected from freezing after it is placed. The excavator should be required to submit a plan for protecting the soil. The plan should include details on the type and amount of material (straw, blankets, extra loose fill, topsoil, etc.) proposed for use as frost protection. The need to protect the soil from freezing is ongoing throughout construction and applies both before **and** after concrete is placed, until backfilling for final frost protection is completed. Foundations placed on frozen soil can experience heaving and significant settlement, rotation, or other movement as the soil thaws. Such movement can also occur if the soil is allowed to freeze **after** the concrete is placed and then allowed to thaw. The higher the percentage of fines (clay and silt) in the fill, the more critical is the need for protection from freezing.

The contractor should be required to adjust the moisture content of the soil to within a narrow range near the optimum moisture content (as defined by the applicable Proctor or AASHTO Test). In general, fill should be placed within 2% of optimum moisture. The need for moisture control is more critical as the percentage of fines increases. Naturally occurring cohesive/semi-cohesive soil are often much wetter than the optimum. Placing and attempting to compact such soils to the specified density may be difficult. Even if compacted to the specified density, excessively wet soils may not be suitable as pavement subgrades due to pumping under applied load. This is especially true when wet cohesive/semi-cohesive soil is used as backfill in utility trenches and like situations. Excessively wet soil in thick fill sections may cause post-construction settlement beyond that estimated for fill placed at or near (±2%) the optimum moisture content.

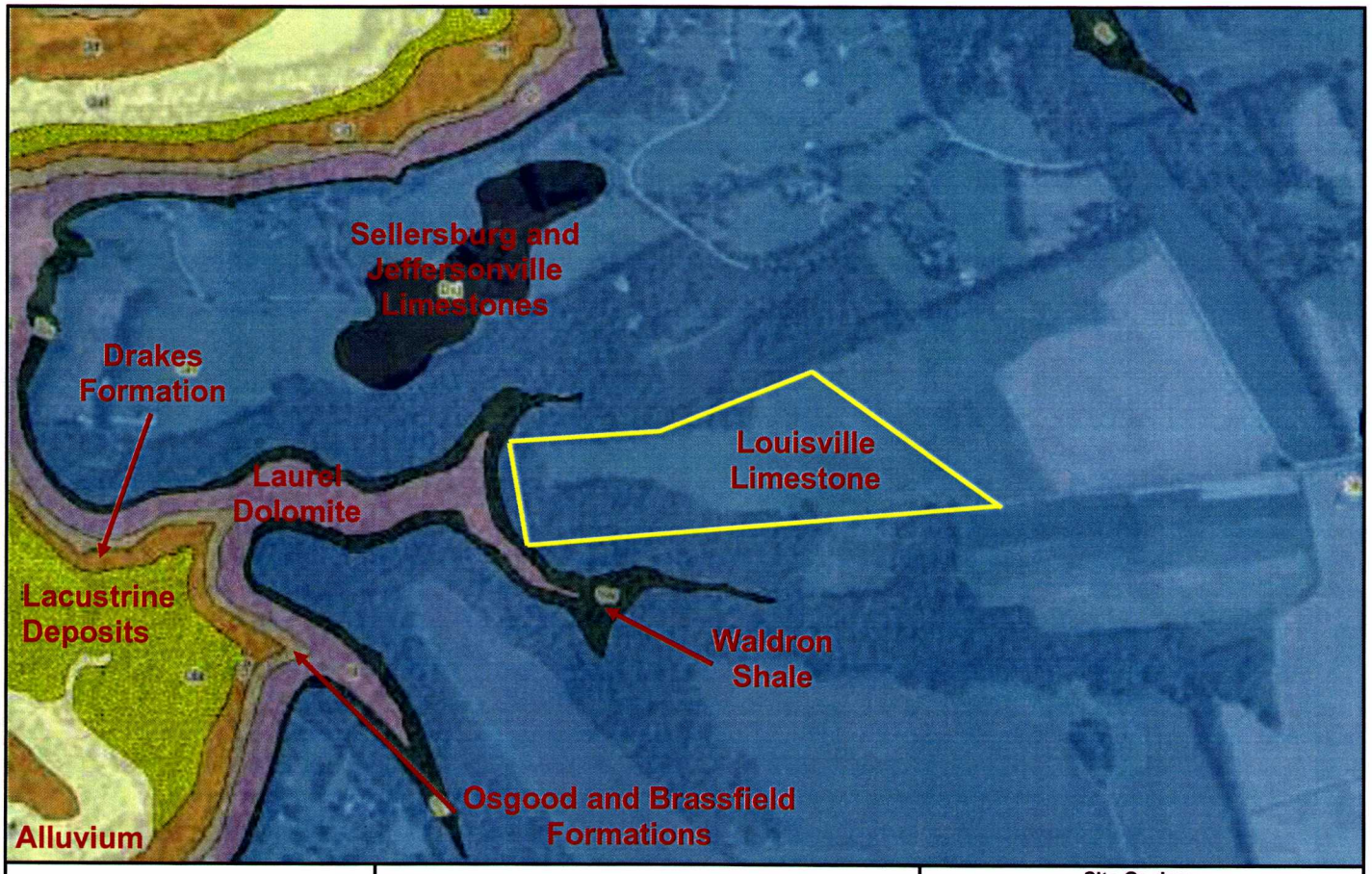
5.0 Limitations

This is investigation is limited to determining the stability of slopes based on a study of published geology and visual reconnaissance performed during a walkover of the site. This investigation includes no drilling, sampling or testing of soils or bedrock since that is beyond the scope of this investigation. This investigation is directed at slopes only and does not include investigation of karst,

support of building foundations or slabs, pavement nor any other structures or utilities.



Elite Homes, Inc.	Greenbaum Associates, Inc.	**Site Location Plan** Fischer Farm Schuler Lane, Louisville, KY Greenbaum Project Number: 19-241G



Elite Homes, Inc.	Greenbaum Associates, Inc.	**Site Geology** Fischer Farm Schuler Lane, Prospect, KY Greenbaum Project Number: 19-241G