GREENBAUM ASSOCIATES, INC.
GEOTECHNICAL & MATERIALS ENGINEERS
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Louisville, Kentucky 40215
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June 30, 2021

Mr. Mike Judah
ST Ventures
2604 River Green Circle
Louisville, KY 40206

Re: Karst/Slope Stability Survey
23± Acre Parcel
Netherwood Patio Homes
Louisville, Kentucky
Project Number 21-139G

Dear Mr. Judah:

On June 10, 2021, a walkover of the above referenced property was performed and a number of slopes with an inclination greater than 20-degrees were viewed. Included is a drawing showing the approximate locations of the slopes as well as a section taken from mapping by the Kentucky Geological Survey showing the surface bedrock formations present at the site. Also included are photos of several of the slopes taken during the walkover of the site. During the walkover no indication of slope instability was noted nor any surface manifestation of karst topography, i.e., sinkholes or springs.

Soils at this site are shown to be residuum, the residual product of weathering of the local bedrock. This site is underlain by multiple bedrock formations including the Louisville Limestone, Waldron Shale, and Laurel Dolomite. 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

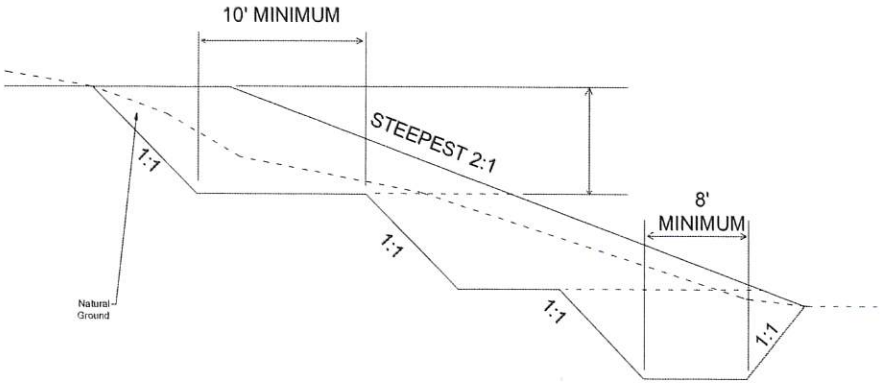
The Kentucky Geological Survey describes the Waldron Shale as:

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.

The Kentucky Geological Survey describes the Laurel Dolomite as:

Dolomite of two types in three distinct bedding sets: One type in upper two fifths of unit is greenish gray to light olive gray, mottled light gray patches; weathers dark yellowish orange; micro-grained to very finely crystalline; calcite in irregular blebs up to 0.8 foot wide and 0.3 foot thick; characterized by even beds separated by stylolites 0.1 to 3 feet apart; oolitic bed at top is prominent in only one exposure near quarries in southeastern part of quadrangle, but is persistent in Brooks, Samuels, Shepherdsville quadrangles and beyond to the south. Second type is more massive, somewhat porous, mottled dolomite in two bedding sets separated by a dark gray to olive gray dolomitic clay shale bed 0.8 to 2.5 feet thick 5 to 8 feet above the base. Lens of coarsely crystalline limestone reported from 6.5 feet above shale break. Contact with underlying formation indistinct through gradational interval of as much as 3 feet; arbitrarily placed at base of lowest persistent dolomite bed separated from overlying dolomite by less than an equivalent thickness of shale. Calcite veinlets associated with slickensides indicate lateral movement of as much as 4 inches along a strike of N. 35? W. in quarry in southeastern part of quadrangle.

The topography of this property is rolling, resulting in substantial 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 below 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.



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 or 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.

This survey is intended to address existing slopes at this site. This is not a geotechnical investigation and does not include any boring, laboratory testing nor modeling of slope stability to determine factor of safety against sliding.

If you have any questions regarding this study, please call.

Sincerely,

GREENBAUM ASSOCIATES, INC.

Luke Van Nevel

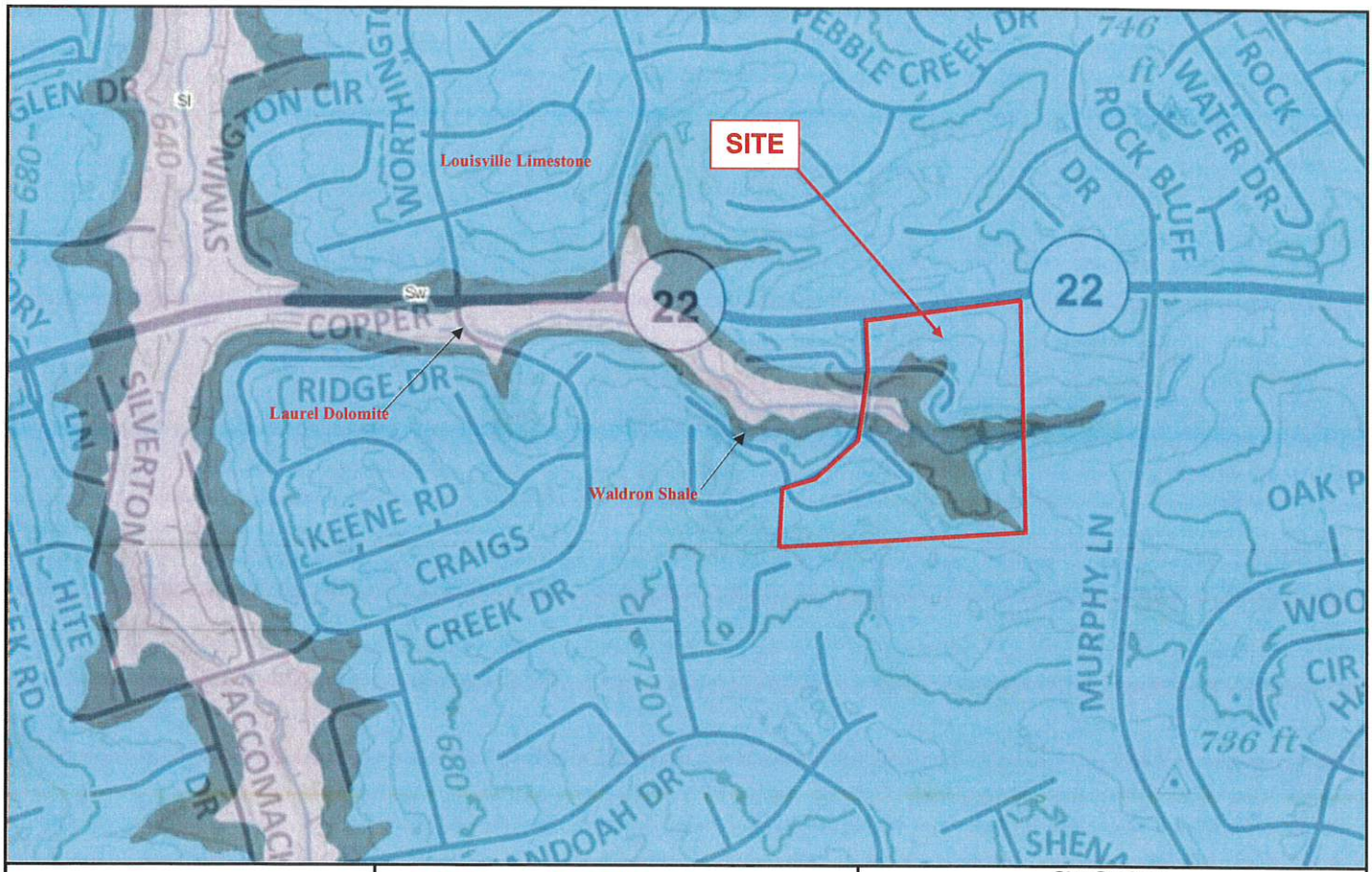
Luke Van Nevel, E.I.T.
Geotechnical Engineer-In-Training

Sandor R. Greenbaum

Digitally signed by Sandor R. Greenbaum
Date: 2021.06.30 13:17:10 -04'00'

Sandor R. Greenbaum, P.E.
Project Engineer

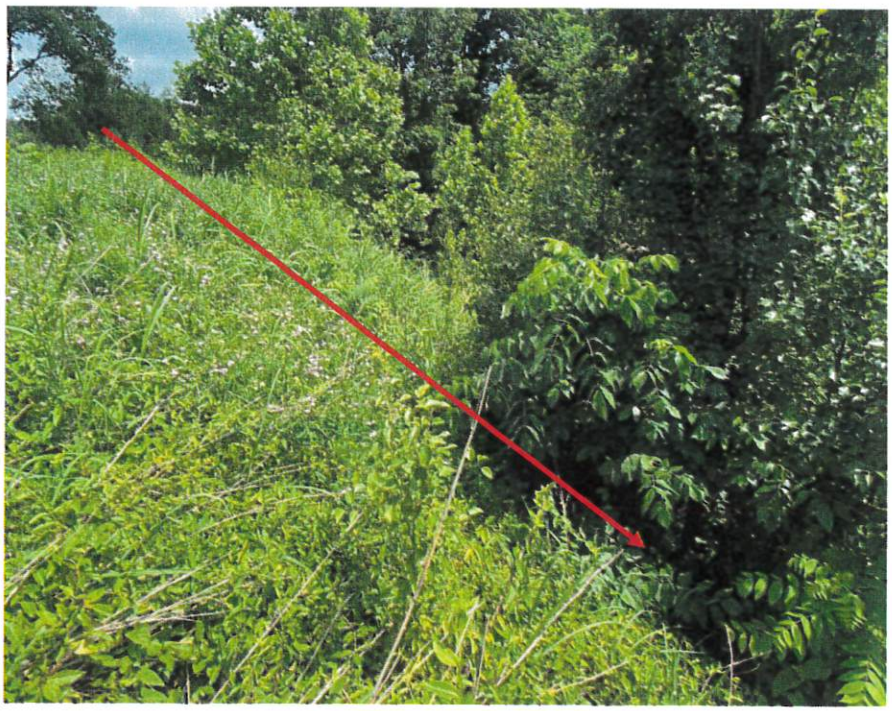
Judah Real Estate Group	Greenbaum Associates, Inc.	**Site Location Plan** Proposed Condominiums Louisville, Kentucky Greenbaum Project Number: 21-139G



Judah Real Estate Group	Greenbaum Associates, Inc.	**Site Geology** Netherwood Condominiums 11001 Jordain Drive, Louisville, KY Greenbaum Project Number: 21-139G

View of slope (N 38°18'59.60" W 085°32'36.80")

View of slope (N 38°18'59.35" W 085°32'35.83")



View of slope (N 38°18'59.60" W 085°32'36.80")

View of slope (N 38°19'00.32" W 085°32'34.84")