November 10, 2022

Mr. Joseph Waldman
Highgates Management
119 Park Glen Avenue
Toronto, Ontario, Canada M6B2C6

Reference: **Johnson Road Residential – Slope Exploration**
1614 Johnson Road
Louisville, Jefferson County, Kentucky 40245
ECS Project No. 61-2735-A

Dear Mr. Waldman:

ECS Southeast, LLP (ECS) conducted a subsurface exploration for the referenced site in accordance with ECS Proposal No. 61-P2887, dated October 7, 2022. This exploration is an extension of the previously conducted ECS Project No. 61-2735, Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential, provided to Highgates Management, dated May 20, 2022.

PURPOSE

The purpose of the evaluation was to explore the materials along slopes greater than 30% that will be disturbed during construction, the depth to bedrock and the shear strength of the soils in these areas are required to be analyzed by a geotechnical engineer per the county development code (Section 4.7.4 of the Land Development Code).

PROJECT INFORMATION

Refer to the attached ECS Project No. 61-2735, **Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential**.

GEOLOGY

Refer to the attached ECS Project No. 61-2735, **Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential**.

SOIL CONSERVATION SERVICE SOIL SURVEY

Refer to the attached ECS Project No. 61-2735, **Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential**.

SITE RECONNAISSANCE

Refer to the attached ECS Project No. 61-2735, **Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential**.

PROVIDED INFORMATION

- "3622 - PREPLAN - 3-30-2022-with slopes" provided by Mindel Scott via email, dated March 30, 2022.
- "3622 - MRDI-11-08-22" provided by Mindel Scott via email, dated November 08, 2022.

SUBSURFACE SUMMARY

Six (6) soil test borings were drilled utilizing a track mounted drill rig with continuous flight augers on October 18, 2022. Soil test boring were conducted in select accessible areas within or near slopes greater than 30% within the planned disturbed areas as shown on the drawings "3622 - PREPLAN - 3-30-2022-with slopes" and "3622 - MRDI-11-08-22". The approximate boring locations were established with a consumer-grade GPS device.

The subsurface generally consisted of a thin layer of topsoil (approximately 2 to 8 inches) underlain by stiff to hard, slightly moist to moist, silty, LEAN and/or FAT CLAY that extended to rubbly WEATHERED LIMESTONE/DOLOMITE. The lower portion of apparent native CLAY (typically 2 to 4 feet below existing grades) contained increasing amounts of rock fragments (gravel to boulder sized). The upper portion of the WEATHERED LIMESTONE/DOLOMITE was rubbly with marginal auger resistance through upper 2 to 4 feet, where encountered. Auger refusal was encountered approximately 4.7 to 11.4 feet below existing grades in borings B-01 to B-05. Refusal was not encountered in boring B-06 with continuous augers extending approximately 15.5 feet below existing grades. Materials encountered at each location were logged. Brief descriptions are provided in the following **Boring Summary**. Refer to the **Boring Location Diagram** for the boring locations, and the **Boring Records** for the depths of materials encountered at each location.

BORING SUMMARY

APPROXIMATE DEPTH (FT)	STRATUM	DESCRIPTION	N-VALUES BLOWS PER FOOT (BPF) (2)
0.0 – 0.7	I	**TOPSOIL –** Approximately 2 to 8 inches of topsoil encountered at the surface materials in all borings.	NA
0.3 – 3.0	II	**CLAY (CL) –** Orange brown to brown, low to moderate, stiff to hard, moist to slightly moist, silty, LEAN CLAY (CL), with trace black oxide nodules, rock fragments and root fibers. Encountered below Stratum I in borings B-01 to B-04.	7 - 28
0.2 – 15.5	III[2]	**CLAY (CL-CH) –** Yellow to orange brown, moderate to high plasticity, very stiff to hard, moist to slightly moist, silty, LEAN to FAT CLAY (CL/CH), with increasing amounts of gravel to boulder sized rock fragments with depth. The lower portion of the stratum appeared to consist of near 50/50 mixtures of soil and rock. Encountered below Stratum II in borings B-03 to B-06.	13 - 43
1.8 – 11.4	IV	**WEATHERED LIMESTONE/DOLOMITE –** Completely to moderately weathered, shades of yellow brown and gray, fine to very fine, rubbly, LIMESTONE/DOLOMITE. The upper 2 to 4 feet of limestone/dolomite was completely to highly weathered with marginal auger resistance at the time of drilling. Encountered below Stratum II and/or III in borings B-01 to B-05.	NA
REFUSAL		Auger refusal was encountered approximately 4.7 to 11.4 feet below existing grades in borings B-01 to B-05. Refusal was not encountered in boring B-06 with continuous augers extending approximately 15.5 feet below existing grades.	

Notes:

(1) This summary is generalized and does not describe the actual conditions in each boring. These zones also may not occur at each location. Depths are approximate. Detailed descriptions of the encountered materials are listed on the **Boring Records** in the **Appendix**.

(2) Classification of Stratum II determined based on Appendix X3 of ASTM D2488-09a, Standard Practice for Description and Identification Of soil (Visual-Manual Procedure)

LABORATORY TEST SUMMARY

STRATUM	MOISTURE CONTENT	LIQUID LIMIT[3]	PLASTIC LIMIT[3]	PLASTICITY INDEX[3]	UNCONFINED COMPRESSIVE STRENGTH (psf)	UNDRAINED SHEAR STRENGTH (psf)	SOIL CLASSIFICATION
II	9.9 – 23.1	--	--	--	2000 – 2350	1000 – 1150	CL
III[2]	9.1 – 23.7	--	--	--	2210 – 6430	1650 - 2690	CL/CH

Notes:

(1) A more detailed summary of the laboratory test results is included on the **Boring Records** and **Laboratory Reports** in the **Appendix**. Detailed descriptions of the laboratory test methods are listed in the **Laboratory Procedures** section of the **Appendix**.

(2) Classification of Stratum III determined based on Appendix X3 of ASTM D2488-09a, Standard Practice for Description and Identification of Soil (Visual-Manual Procedure).

(3) Atterberg limits tests were not completed at the time of this report. A revised report will be sent upon the completion of the tests.

CONCERNS

Slope Stability

The slopes located at the site typically are marginally stable. However, the soils mantling the slopes are very sensitive to disturbance and placement of fill along the surface unless carefully planned and executed. Due to the marginally stable nature of the slopes, disturbance, and construction on, or over slopes steeper than 3H:1V should be avoided as much as possible. Typically, for cut slopes in the undisturbed soils on-site or fill slopes comprised of properly placed and compacted controlled fill constructed over stable bases, slopes 3H:1V or flatter are stable. It generally is advisable for the crest of slopes to be located at least 5 feet from the edge of paved areas and 15 feet from the edge of buildings. At a minimum, construction on these slopes should be carefully monitored during construction by ECS.

Colluvium

It would appear that some of the slopes onsite are blanketed by a layer of colluvium (soil which has moved down the slopes as a result of gravity, weathering, and periodic saturation), underlain by residual soils (soil that has weathered from the parent rock), a zone of weathered rock, then more competent rock layers. The natural stability of the colluvium covered slopes is marginal, since by definition, the surface materials periodically move downhill when weathering progresses and/or climatic conditions result in long periods of soil saturation and increases seepage along rock joints or beds.

The possibility of isolated slope failures is an inherent risk that must be accepted with construction in the geologic setting of the site. This risk can be reduced by following the recommendations contained within this report. It must be emphasized that construction and design methodologies are much more critical for this project than typical construction. For example, any retaining walls designed should be designed by an engineer intimately familiar with the nuances of the underlying geologic formation (e.g., inherent slope stability issues, global stability, and the possibility of isolated seeps above, behind, or below the wall).

Dry Soils

The upper portion of the native soils encountered onsite at higher elevations and steeper slopes was generally dryer (slightly moist). Clay soils that underlie most of our region shrink and harden as they become drier. When the moisture returns, due to rainfall or other sources, the clays will swell and soften. These effects can cause numerous problems for existing slopes as well as new construction. Cuts and fill placement within these areas must also be monitored. If placed too dry or exposed for prolonged periods of time, the clay soils may swell or soften causing failures of slopes.

Weathered Limestone and Dolomite

Refusal depths ranged from approximately 4.7 to 11.4 feet below the existing grades, where encountered. The results of our exploration indicated that the site was underlain by limestone and dolomite with a thick weathered zones and possible shale layers. Based on past experience, the weathered portion of onsite limestone and dolomite quickly loses strength and breaks down into a weak silty soil when exposed to water.

Bearing capacity, slope instability, settlement, fill compaction and floor slab support problems have been caused by the poor structural behavior of the weathered limestone/dolomite. The following measure can be taken to reduce these concerns of development:

- Lay back cut slopes at 3:1 (H:V) or flatter.
- Establish a protective vegetative cover over cut slopes as soon as possible.
- Plan for greater than normal future maintenance of cut slopes.
- Remove the weathered portion of the underlying limestone/dolomite, where encountered at proposed grades.
- Remove the weathered limestone/dolomite to a minimum depth of 12 inches below floor slabs.
- Place foundation concrete the same day the excavations are made or over-excavate the foundations by several inches and place a thin layer ("mud mat") of concrete.
- Restore the required subgrade level with controlled soil fill.
- Utilize special procedures to break down the weathered limestone into a soil that can be properly compacted.

Surface and Subsurface Water Control
Large volumes of surface water traverse the site. Since water is typically the driving mechanism of most failures in the native soils, the removal of water from the steep slopes onsite is critical. Drainage under floor slabs and behind walls will be an important aspect in controlling potential water issues. The steep grades and resulting high velocities may necessitate the use of water dissipating devices.

Erosion Control
The soils and rock on-site are highly erodible and must be managed accordingly. The steep grades exacerbate the erosion issue. Excessive erosion could cause blockage of existing drainage ways, resulting in the ponding of water, which may trigger slope instability or failure. Given the inherent instability of the onsite slopes, erosion control for this project will be critical. Improper erosion control also may trigger complaints from surrounding residents.

Groundwater
Groundwater was not encountered at the time of drilling. However, groundwater seepage at the soil/rock interface and within the underlying limestone/dolomite onsite is common and should be anticipated. Groundwater tends to lower stability and cause sidewall collapse, requiring even shallow excavations to be laid back or braced. Drainage below floors, foundations, and below-grade structures (subfloors, basements, retaining walls, etc.) will be critical. Proper design and construction of drainage components will be crucial.

Springs that require re-routing or channeling may be present. The presence of springs generally can complicate or slow construction in the affected areas until the springs are properly treated. Springs also may cause long-term water problems on slopes and in building or pavement areas if not properly treated. Since recommendations to address any springs encountered will be heavily dependent on the actual condition and location of the springs, specific recommendations to address individual springs cannot be provided until construction.

FINDINGS

Additional instability concerns as it pertains to Section 4.7.4 and 4.7.5 of the Land Development Code were not encountered during this limited subsurface exploration. See below for a revised summary of findings as presented in ECS report dated May 20, 2022.

Based on our review of the above reference observations and information, and on our past experience with site development for similar conditions in Jefferson County, our opinion is that most of the on-site slopes (excluding small, localized erosion features along swales and streams) in the observed areas were generally stable at the time of our reconnaissance. Evidence of minor instability was observed in isolated areas in the north and east portions of the site (Slope Areas).

The current, on-site localized slope instability observed appears to be related to the following factors based on the limited subsurface exploration conducted:

- Relatively thin depths of soil in slope areas
- Cohesive (clayey) soil matrix
- Dry and exposed soils
- Rocky soil texture (e.g. colluvium)
- Limestone, dolomite, and/or shale bedrock
- Numerous trees and other vegetation

The north and east portions of the site where minor instability was observed during the previous evaluation (ECS Project No.: 61-2735) should be further investigated during the construction phase of the project once the location and planned elevation of the proposed structures and related improvements are known.

Based on the conditions observed, our opinion is that additional geotechnical exploration/analyses including soil/rock test borings/coring, are not required for most of the evaluated on-site slopes, provided that the planned subdivision is designed and constructed utilizing the guidelines included in this report. However, ECS should be contacted to review and evaluate specific foundation and design plans immediately prior to and during construction for areas within the 20% or greater slope areas or where colluvium and/or weathered rock are encountered at grade.

The following guidelines should be used to help maintain the stability of the existing and planned slopes during the design and construction of the new subdivision, and over the life of the new homes. These guidelines include:

- ECS should be contacted to review and evaluate specific foundation and design plans immediately prior to and during construction.
- All foundations located in areas with slopes greater than 20% should bear entirely on competent rock (sound and continuous).
- Plan to install foundation and sub-floor drainage systems for structures bearing entirely on rock or near the soil/rock interface.
- Plan grading to minimize changes to existing topography along slopes.
- Minimize disturbance to slopes and vegetation outside new construction areas.
- Avoid significant transverse cuts along face or at the toe of existing slopes.
- Avoid significant embankments on the face, or along or at the crest of existing slopes.
- Avoid placing new construction at or within 10 feet of the crest of existing slopes.
- Maintain the following limits for new cuts in soil without additional geotechnical exploration and analysis:
    - 3:1 (horizontal: vertical) or flatter slopes.
    - Properly strip all vegetation, topsoil, etc. where fill will be placed.
    - Construct embankments with controlled fill compacted to at least 98 percent of the Standard Proctor maximum dry density and within 2 percent of the optimum moisture content.
    - Maximum fill embankment height: 5 feet.
    - Horizontally bench new fill into existing slopes in maximum one-foot vertical steps.
- Established drainage features displaying evidence of active or ephemeral springs should be preserved by constructing a spring box drainage blanket and/or finger drain, as appropriate, to provide an outlet for accumulated discharge flow.
- Provide adequate erosion control/protection of soil (silt fencing, geotextile fabric, erosion mats, etc.) surface water drainage control (drainage ditch, gravity drains, blanket drains, etc.) during construction and over the life of the subdivision.
- Establish permanent vegetative cover and protect cut grades (placement of structural fill, well graded stone, vegetative cover, or equivalent) as soon as practical to reduce exposure to potential adverse conditions.

CLOSING

We appreciate the opportunity to serve as your geotechnical consultants for this project. We look forward to future association with you on this and other projects.

Respectfully submitted,
ECS Southeast, LLP

William "Grant" Hess, P.G.
Project Geologist
ghess@ecslimited.com

Liz Blandford Newcomb, P.E.
Principal Engineer
lnewcomb@ecslimited.com

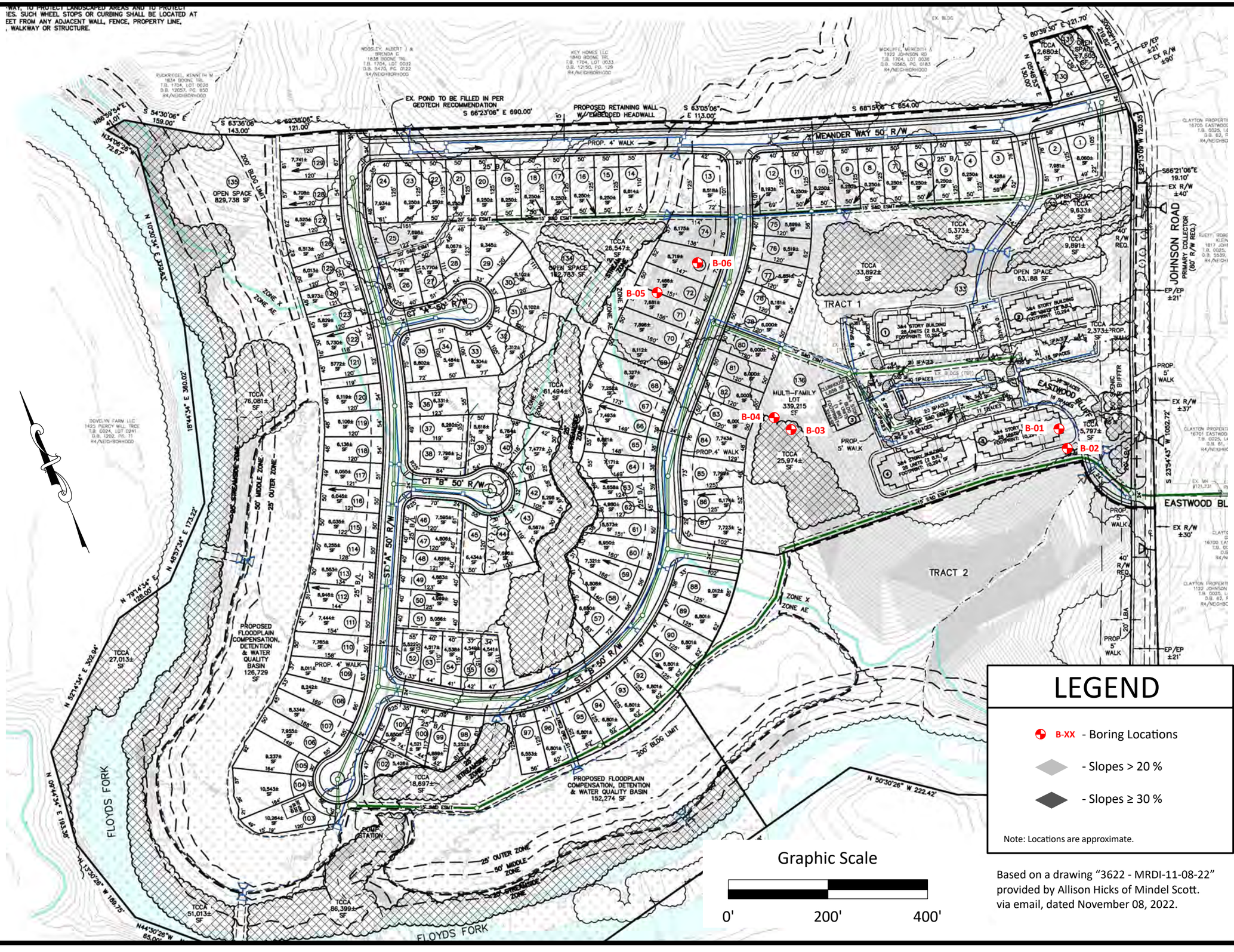
Attachments:
Site Location Diagram
Boring Location Diagram
Soil & Rock Classification
Boring Legend
Boring Records
Boring Composite
Field & Laboratory Procedures
22-MSUB-0004 - 2022-08-26
ECS Project No. 61-2735, Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential

SITE LOCATION DIAGRAM

JOHNSON ROAD RESIDENTIAL - SLOPE EXPLORATION

1614 JOHNSON RD, LOUISVILLE, KENTUCKY 40245

ENGINEER	FEN
SCALE	AS NOTED
PROJECT NO.	61-2735-A
SHEET	1 OF 1
DATE	11-07-2022



Boring Location Diagram
Johnson Road Residential – Slope Exploration
1614 Johnson Road
Louisville, Jefferson County, Kentucky 40245

Drawn By: WGH
Checked By: FEN
Scale: As Shown

Project No.: 61-2735-A
Drawing No.: 2735-A BLP
Date: 11/07/2022

ECS Southeast, LLP
1762 Watterson Trail
Louisville, Kentucky 40299
Tel. (502) 493-7100

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SOIL & ROCK CLASSIFICATION

SOIL CLASSIFICATION

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS	Clean Gravels	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	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	Clean Sands	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sand, little or no fines
		Sands with fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS	Liquid Limit less than 50	ML	Inorganic silts, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to moderate plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS	Liquid Limit greater Than 50	MH	Inorganic silts, micaeceous or diatomaceous fine sand or silty soils
			CH	Inorganic clays of high plasticity
			OH	Organic clays of moderate to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents

SOIL CONSISTENCY

SPT N: Standard Penetration Test N-Value N^1 – Manual Hammer (Rope & Pulley - 60% Efficiency) N^2 – Automatic Hammer (Free-Fall - 96% Efficiency)

COARSE GRAINED SOILS		
SPT N^1	SPT N^2	Relative Density
0-4	0-3	Very loose
4-10	3-6	Loose
10-30	6-19	Medium dense
30-50	19-31	Dense
> 50	> 31	Very dense

FINE GRAINED SOILS		
SPT N^1	SPT N^2	Field Identification
0-2	0-1	Very soft – Easily penetrated several inches by fist
3-4	2-3	Soft – Easily penetrated several inches by thumb
5-7	3-4	Firm – Can be penetrated several inches by thumb with moderate effort
8-15	5-9	Stiff – Readily indented by thumb but penetrated only with great effort
16-30	10-19	Very stiff – Readily indented by thumbnail
> 30	> 19	Hard – Indented with difficulty by thumbnail

SOIL PARTICLE SIZES

Description	Size Limits	Familiar Example
Boulder	12 inches or more	Larger than basketball
Cobble	3 - 12 inches	Orange to basketball
Coarse gravel	¾ - 3 inches	Grape to orange
Fine gravel	4.75 mm (No. 4 sieve) - ¾ inch	Pea to grape
Coarse sand	2-4.75 mm (No. 10 to 4 sieve)	Rock Salt
Medium sand	0.42-2 mm (No. 40 to 10 sieve)	Table Salt
Fine sand	0.075-0.42 mm (No. 200 to 40 sieve)	Powdered sugar
Silt/Clay/Fines	Less than 0.075 mm (No. 200)	Not visible to naked eye

RELATIVE PROPORTIONS

Description	Percent
Trace	1-5
Few	5-15
Little	15-30
Some	30-50
Mostly	50-100

ROCK CONTINUITY

Description	Core Recovery (%)
Incompetent	0-40
Competent	40-70
Fairly Continuous	70-90
Continuous	90-100

ROCK QUALITY DESIGNATION

Description	RQD (%)
Very Poor	0-25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

ROCK BEDDING

Description	Thickness (in)
Parting	< 0.3
Band	0.3-2.5
Thin Bed	2.5-6.0
Medium bed	6.0-12.0
Thick bed	12.0-36.0
Massive	> 36.0

ROCK HARDNESS (Descriptions for rock core samples)

Description	Definition
Very soft	Can be broken with fingers
Soft	Can be scratched with fingernail; only edges can be broken with fingers
Moderately hard	Can be easily scratched with knife; cannot be scratched with fingernail
Hard	Difficult to scratch with knife; hard hammer blow to break specimen
Very hard	Cannot be scratched with knife; several hard hammer blows to break specimen

ROCK WEATHERING (Descriptions for rock core samples)

Description	Definition
Completely	Rock decomposed to soil; rock fabric and structure completely destroyed
Highly	Most minerals are decomposed; texture indistinct but fabric preserved; strength greatly reduced
Moderately	Discoloration throughout and weaker minerals decomposed; texture preserved but strength less than unweathered rock
Slightly	Discoloration around open fractures; strength preserved
Unweathered	No sign of decomposition

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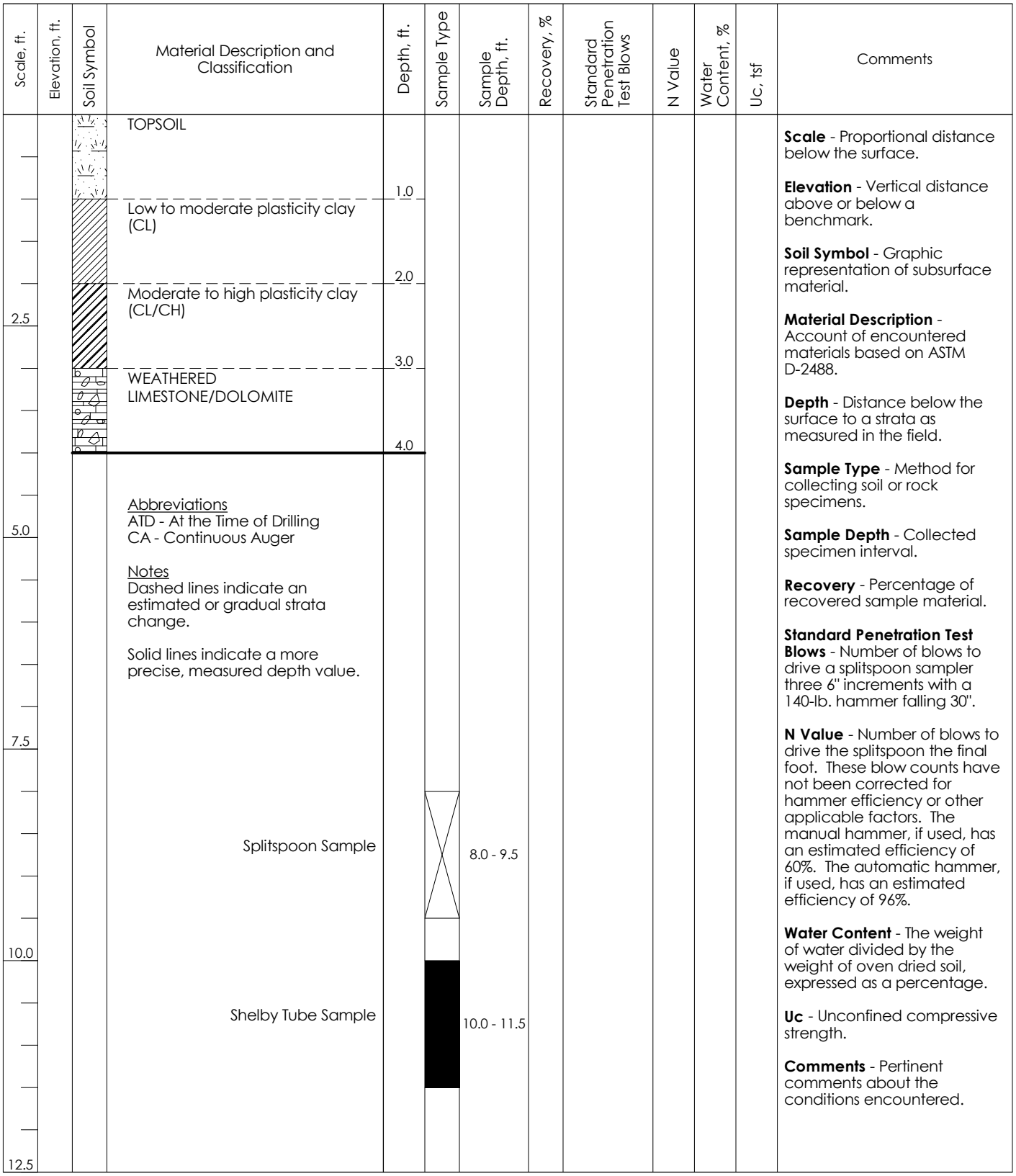
Louisville, KY 40299

BORING LEGEND



Scale - Proportional distance below the surface.

Elevation - Vertical distance above or below a benchmark.

Soil Symbol - Graphic representation of subsurface material.

Material Description - Account of encountered materials based on ASTM D-2488.

Depth - Distance below the surface to a strata as measured in the field.

Sample Type - Method for collecting soil or rock specimens.

Sample Depth - Collected specimen interval.

Recovery - Percentage of recovered sample material.

Standard Penetration Test Blows - Number of blows to drive a splitspoon sampler three 6" increments with a 140-lb. hammer falling 30".

N Value - Number of blows to drive the splitspoon the final foot. These blow counts have not been corrected for hammer efficiency or other applicable factors. The manual hammer, if used, has an estimated efficiency of 60%. The automatic hammer, if used, has an estimated efficiency of 96%.

Water Content - The weight of water divided by the weight of oven dried soil, expressed as a percentage.

Uc - Unconfined compressive strength.

Comments - Pertinent comments about the conditions encountered.

Remarks: Additional information about the surface, subsurface or other conditions that could impact the exploration results.

ECS Southeast, LLP
1762 Watterson Trail
Louisville, KY 40299

BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-01
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	691 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
		TOPSOIL (5 inches)	0.4								
	690.0	CLAY, silty, orange and yellow brown, moderate plasticity, hard, moist, (CL), with some weathered rock fragments and granules			0.0 - 1.5	72	5-16-12	28			
2.5			2.3		1.5 - 3.0	94	10-10-17	27			
	687.5	LIMESTONE/DOLOMITE, completely to highly weathered, yellow brown, very fine to fine grained									
		- rubbly below 4.0 feet									
5.0					4.0 - 5.5	100	17-22-50/4	50/4			
	685.0										
		- highly to moderately weathered, light gray to yellow brown below 6.5 feet			6.5 - 6.8	100	50/3	50/3			
			7.1								
7.5		Boring Terminated at Auger Refusal									
	682.5										
10.0											
	680.0										
12.5											

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

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Louisville, KY 40299

BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-02
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	684 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL (4 inches)	0.3								
	682.5		CLAY, silty, orange and yellow brown, moderate plasticity, very stiff, moist, (CL), with some weathered rock fragments and granules			0.0 - 1.5	56	4-5-9	14	9.9		
2.5				2.2		1.5 - 2.9	90	7-26-50/5	50/5	9.1		
	680.0		LIMESTONE/DOLOMITE, completely to highly weathered, yellow brown and medium gray, very fine to fine grained, rubbly									
			- highly to moderately weathered, light gray to yellow brown below 4.0 feet	4.7		4.0 - 4.4	100	50/5	50/5			
5.0			Boring Terminated at Auger Refusal									
	677.5											
7.5												
	675.0											
10.0												
	672.5											
12.5												

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

ECS Southeast, LLP
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BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-03
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	654 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
		TOPSOIL (6 inches)	0.5								
	652.5	CLAY, silty, orange brown, moderate plasticity, stiff, moist, (CL), with trace weathered rock fragments and root fibers	1.5		0.0 - 1.5	94	3-3-4	7	23.1		
2.5		CLAY, silty, yellow orange, moderate to high plasticity, stiff to very stiff, moist, (CL/CH), with trace weathered rock fragments and granules			1.5 - 3.0	94	3-6-7	13	10.9		
	650.0	- hard, slighty moist, with little gravel-sized rock fragments below 4.0 feet									
5.0					4.0 - 5.5	89	7-13-18	31	10.5		
	647.5	LIMESTONE/DOLOMITE, completely to highly weathered, yellow brown and medium gray, rubbly	6.5								
7.5					6.5 - 8.0	89	12-22-19	41			
	645.0	- highly to moderately weathered, very fine to fine grained below 9.0 feet									
10.0					9.0 - 9.4	50	50/5	50/5			
	642.5	Boring Terminated at Auger Refusal	11.4								
12.5											

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

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BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-04
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	655 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
		TOPSOIL (8 inches)									
		CLAY, silty, orange and yellow brown, moderate plasticity, stiff, slightly moist, (CL), with trace weathered rock fragments and root fibers	0.7		0.0 - 1.5	94	2-3-4	7			
					1.5 - 2.5	100					
2.5	652.5	- very stiff, with trace black oxide nodules below 2.5 feet	3.0								
		CLAY, silty, yellow orange, moderate to high plasticity, very stiff, slightly moist, (CL/CH), with trace rock fragments			2.5 - 4.0	100	7-8-11	19	20.1		
5.0	650.0				4.0 - 5.5	94	5-8-12	20	23.7		
		- hard, with few to little gravel-sized rock fragments below 5.2 feet			5.5 - 7.1	79					
7.5	647.5	LIMESTONE/DOLOMITE, completely to highly weathered, yellow brown, rubbly	7.1								
		- highly to moderately weathered, yellow to light gray, very fine grained below 9.0 feet			9.0 - 9.1	100	50/1	50/1			
10.0	645.0		10.2								
		Boring Terminated at Auger Refusal									
12.5	642.5										

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

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Louisville, KY 40299

BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-05
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	625 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL (2 inches)	0.2								
			CLAY, silty, orange brown, moderate to high plasticity, very stiff, slightly moist, (CL/CH), with trace rock fragments and root fibers			0.0 - 1.5	78	4-6-7	13	20.4		Shelby tube obtained (failed) from approximately 1.0 to 2.5 below at a location offset approxiamtely 5.0 feet south.
			- hard, with little gravel to boulder-sized rock fragments below 1.7 feet			1.5 - 1.9	100	50/5	50/5			
2.5	622.5											
			- with some gravel-sized rock fragments and granules below 4.0 feet			4.0 - 5.5	94	15-17-22	39	11.2		Shelby tube obtained (failed) from approximately 4.0 to 5.5 below at a location offset approxiamtely 5.0 feet south.
5.0	620.0											
				6.5		6.5 - 6.8	100	50/4	50/4			
			LIMESTONE/DOLOMITE, completely to highly weathered, yellow brown, rubbly									
7.5	617.5											
				8.8								
			Boring Terminated at Auger Refusal									
10.0	615.0											
12.5	612.5											

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

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BORING RECORD

Project Name	**Johnson Road Residential - Slope Exploration**			Boring No.	B-06
Location	**1614 Johnson Road, Louisville, Kentucky 40245**			Project No.	61-2735-A
Client	**Highgates Management**			Elevation	639 (a)
Driller	R. Mathes	Rig Type	Mobile B-53	Started	10/18/2022
Drill Method	Continuous Auger	Hammer Type	Automatic	Completed	10/18/2022
Groundwater	Not encountered ATD			Logged By	G. Hess
				Weather	50's Partly Cloudy

Scale, ft.	Elevation, ft.	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
		TOPSOIL (2 inches)	0.2								
		CLAY, silty, yellow orange, moderate to high plasticity, very stiff, slightly moist, (CL/CH), with little rock fragments and granules			0.0 - 1.5	89	8-8-11	19	13.7		Shelby tube obtained from approximately 1.0 to 2.5 below at a location offset approxiamtely 5.0 feet south.
		- hard, with some gravel-sized rock fragments below 2.0 feet			1.5 - 3.0	89	15-16-22	38	12.0		
	635										
5					4.0 - 5.4	100	25-34-50/5	50/5	10.6		Shelby tube obtained (failed) from approximately 5.0 to 6.5 below at a location offset approxiamtely 5.0 feet south.
		- with few cobble to boulder-sized rock fragments below 5.1 feet									
		- few gravel-sized rock fragments below 6.5 feet			6.5 - 8.0	83	13-21-22	43	11.5		
	630										
10		- with little gravel to boulder-sized rock fragments below 9.0 feet			9.0 - 10.5	83	39-22-18	40			
	625										
15			15.5								Continuous auger extended to 15.5 feet ATD.
		Boring Terminated									

Remarks: a) Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

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1762 Watterson Trail
Louisville, KY 40299

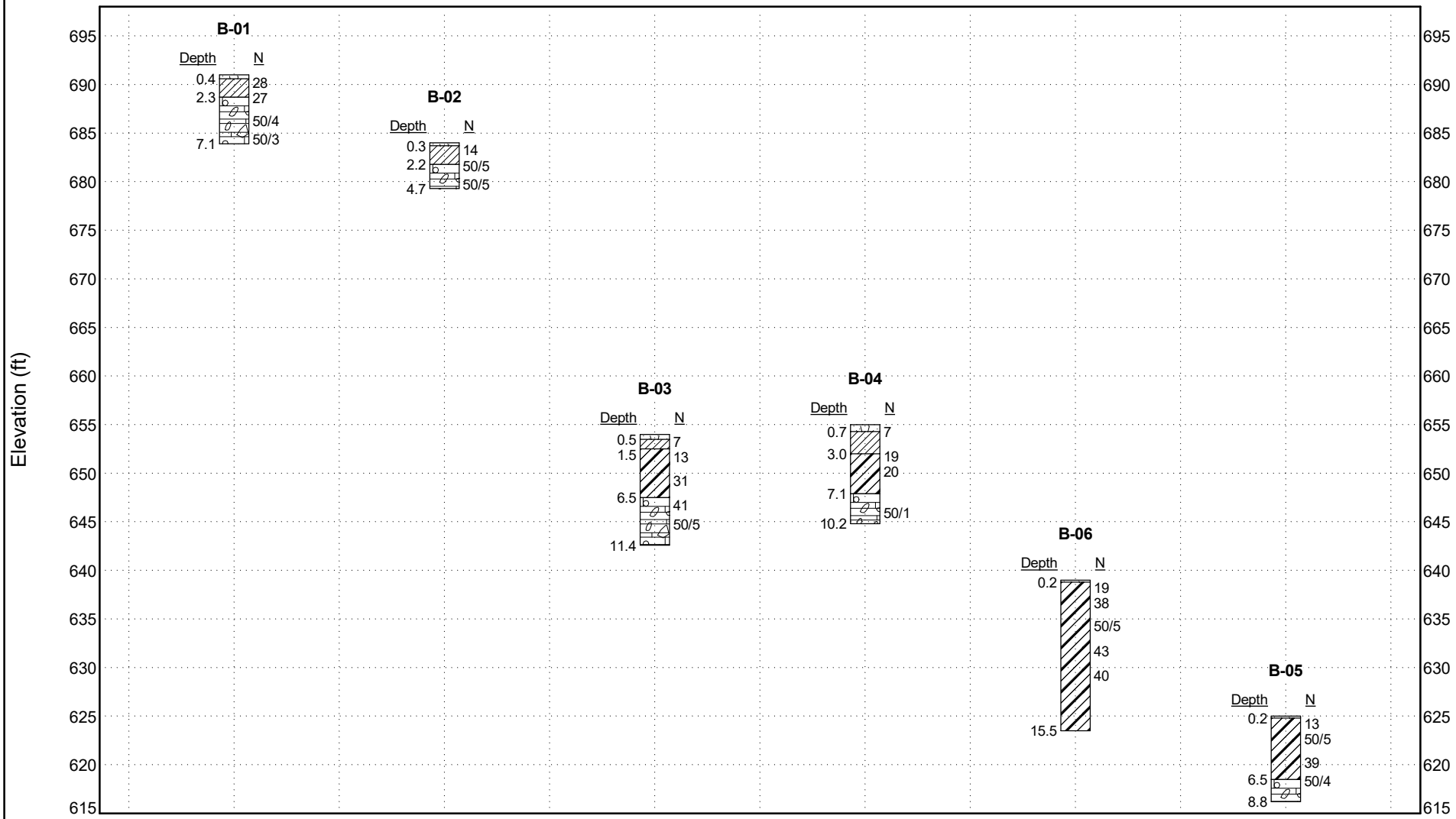
BORING COMPOSITE

CLIENT Highgates Management

PROJECT NAME Johnson Road Residential - Slope Exploration

PROJECT NUMBER 61-2735-A

PROJECT LOCATION 1614 Johnson Road, Louisville, Kentucky 40245



NOTE: The above horizontal boring spacing does not representative the actual distance between borings encountered on-site. Ground surface elevations interpolated to + 1 foot from Digital Elevation Model (DEM) data obtained from the "KYFromAbove" surface elevation and aerial photography database, revised May 5, 2021.

Field Procedures

General
ECS conducts field sampling and testing procedures in general accordance with methods of the American Society for Testing Materials (ASTM) and widely accepted geotechnical engineering standards. A brief description of the procedures we utilize is provided in the following paragraphs.

Boring Locations and Elevations
Boring locations typically are selected by our project manager. The project manager establishes the boring locations in the field by pacing or measuring distances, and estimating angles relative to existing site landmarks. When topographic plans of the site are provided, the project manager estimates the surface elevation of the boring locations using available information. Surveying to determine the locations and elevations of the borings is beyond the scope of typical geotechnical studies; therefore, the boring locations and elevations should be considered approximate.

Boring Records
Our interpretation of the conditions encountered at each location is indicated on the Boring Records, which are prepared from the observations of the ECS field engineer or geologist during drilling or excavation, our engineering review of the soil samples obtained, the results of laboratory testing on selected samples, and our experience with similar subsurface conditions. Soil descriptions are made using the Unified Soil Classification System and/or ASTM D-2488 as guides. The depths designating strata changes are estimations and only representative of depths at that specific boring location. In many geologic settings, the transition between strata is gradual. A Boring Legend, which defines the symbols and other pertinent information presented on the Boring Records, is provided with this report. The subsurface conditions indicated on our Boring Records represent only the conditions encountered at the specific boring location at the time of our exploration. The groundwater observations were made at the time of drilling and may vary with changes in the season and weather.

Soil Borings (ASTM D-1452)
Soil borings are made with hollow stem augers or continuous augers which are mechanically advanced by a powered drill rig. At selected depths, soil samples are obtained with either a split-barrel sampler or a thin wall tube sampler. Soil borings are advanced to refusal, or to maximum depths as defined in our scope of work. All boring data, including sampling intervals, penetration resistances, soil classifications, and groundwater observations, are presented on the attached Boring Records.

Undisturbed Soil Samples (ASTM D-1587)
The thick walled split-barrel sampler causes significant disturbance to the soil during penetration. Therefore, split-barrel samples are rarely suitable for laboratory testing to determine sensitive engineering properties of the soil such as in-situ shear strength and compressibility. When required, relatively undisturbed samples are obtained with thin walled Shelby tubes, which cause much less disturbance during sampling. The tubes are slowly and uniformly pushed into the soil at selected sampling intervals. The tube is then returned to the surface and the length of the recovered sample is measured and recorded. These samples are sealed to preserve the natural soil moisture and then transported to our laboratory for extrusion, review and/or testing.

Standard Penetration Test (SPT) Split-Barrel Samples (ASTM D-1586)
A split-barrel or "splitspoon" is inserted into the borehole to obtain soil samples. The sampler is driven three, 6-inch increments with a 140-pound hammer falling from a height of 30 inches. The "standard penetration resistance" or "N-value" is the number of hammer blows required to drive the sampler the final 12 inches. The N-value, when properly evaluated, is an index of soil strength and/or density. Upon completion of each standard penetration test, the sampler is brought to the surface and the tube is opened to expose the recovered soil. Our project manager examines the sample, records the soil description and other pertinent information, and places a representative portion of the soil into a sealed container for transportation to our laboratory.

Refusal

Refusal is the term applied to material that cannot be penetrated with augers or has a standard penetration resistance exceeding 50 blows per 6-inch increment. Refusal may be encountered on continuous bedrock, discontinuous floaters, cemented soil, weathered rock, debris, buried structures, or other hard subsurface materials. Refusal materials can be evaluated only by obtaining a core of the material. This limitation must be considered when evaluating refusal depths where coring is not conducted.

Laboratory Procedures

General
Laboratory tests are generally conducted to satisfy one or more of the following objectives: (1) confirmation of visual-manual soil identification; (2) determination of index values used to estimate soil engineering properties (i.e., strength, compressibility and permeability); or (3) direct measurement of specific soil properties. The tests selected for a given project are dependent on the subsurface conditions encountered, as well as specific project requirements, such as structural loads and planned grade changes. The results of all laboratory tests conducted for this project are listed on the Boring Records, Laboratory Test Data Summary, or laboratory data curves in the Appendix. Brief descriptions of the test procedures are provided below.

Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488)
The Visual-Manual Procedure provides a general guide to the engineering properties of soils and enables the engineer to apply past experience to current situations. Samples obtained during the field exploration are examined and visually described and identified by a geotechnical engineer or geologist. The soils are typically identified according to predominant particle size (clay, silt, sand, etc.), consistency (based on apparent stiffness and the number of blows from standard penetration tests), color, moisture and group symbol (CL, CH, SP, SC, etc.). Unless otherwise indicated, the soil descriptions in this report are based on the Visual-Manual Procedure.

Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D 2487)
The Visual-Manual Procedure described above is primarily qualitative. The Unified Soil Classification System (USCS) is used when precise soil classification is required. The USCS is based on laboratory determination of particle-size characteristics, liquid limit, and plasticity index. Using these test results, the soil can be classified according to the Unified Classification System, which provides an index for estimating soil behavior.

Water (Moisture) Content of Soil (ASTM D 2216)
Moisture content is one of the most important index properties used in establishing a correlation between soil behavior and soil properties such as strength and compressibility. The moisture content, along with the liquid and plastic limits, are used to express the relative consistency or liquidity index of a soil. Increasing moisture contents typically reflect lower strengths for a given soil. The soil moisture content is the ratio, expressed as a percentage, of the mass of “pore” or “free” water in a given mass of soil to the mass of the solid soil. Moisture content samples are taken from the sealed container obtained during the field exploration phase of a project. Each sample is weighed, and then placed in an oven set to 110oC + 5o. Each sample remains in the oven until the free moisture evaporates. Each dried sample is removed from the oven, allowed to cool, and then weighed. The moisture content is computed by dividing the weight of evaporated water by the weight of the dry sample.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318)
Depending upon the relative moisture content, a fine-grained soil may occur in a liquid, plastic, or solid state. In current usage, the liquid limit (LL) and plastic limit (PL) of a soil are referred to as the “Atterberg Limits”, which establish the approximate moisture contents at which the soil changes state. This test method is an integral part of several engineering classification systems to characterize the fine grained fractions of soils. It is also used with other soil properties to correlate with engineering behavior such as compressibility, permeability, compactability, shrink-swell, and shear strength. The liquid limit is the moisture content at which a soil becomes sufficiently "wet" to behave as a heavy viscous fluid (i.e., transition from plastic to liquid state). It is defined as the moisture content at which the soil, when placed in a standard brass bowl, makes a 1/2-inch closure in a groove cut through the soil after the bowl is dropped 25 times at a specified height and rate. The plastic limit is the moisture content at which the soil begins to lose its plasticity (i.e., transition from plastic to semi-solid state). It is defined as the lowest moisture content at which the soil can be rolled into 1/8-inch diameter threads without crumbling. The plasticity index (PI) is the difference between the liquid limit and the plastic limit, and is the range of moisture content over which a soil deforms as a plastic material.

Unconfined Compressive Strength of Cohesive Soil (ASTM D 2166)

The primary purpose of the unconfined compressive strength test is to quickly obtain the approximate compressive strength of soils that possess sufficient cohesion to permit testing in the unconfined state. Tests are conducted on undisturbed, remolded, or compacted soil specimens, using strain controlled application of an axial load. Loading is increased until the sample fails (the load values begin to decrease with increasing strain) or until 15 percent strain is reached. The unconfined compressive strength is the maximum compressive stress, or the compressive stress at 15 percent strain, whichever is developed first.

GENERAL NOTES:

1. DOMESTIC WATER SUPPLY:
   SUBJECT SITE CAN BE SERVED BY THE LOUISVILLE WATER COMPANY. THE NECESSARY WATER SYSTEM IMPROVEMENTS REQUIRED TO SERVICE THE DEVELOPMENT SHALL BE AT THE OWNER/DEVELOPER'S EXPENSE.
2. TREE PRESERVATION:
   A TREE PRESERVATION PLAN SHALL BE PROVIDED TO THE PLANNING COMMISSION'S STAFF LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES ON THE SITE.
3. PROTECTION OF TREES TO BE PRESERVED:
   CONSTRUCTION FENCING SHALL BE ERECTED PRIOR TO ANY GRADING OR CONSTRUCTION ACTIVITIES–PREVENTING COMPACTION OF ROOT SYSTEMS OF TREES TO BE PRESERVED. THE FENCING SHALL ENCLOSE THE AREA BENEATH THE DRIP LINE OF THE TREE. CANOPY AND SHALL REMAIN IN PLACE UNTIL ALL CONSTRUCTION IS COMPLETE. NO PARKING, MATERIAL STORAGE OR CONSTRUCTION ACTIVITIES SHALL BE PERMITTED WITHIN THE FENCED AREA.
4. A LANDSCAPE AND TREE CANOPY PLAN PER CHAPTER 10 OF THE LDC SHALL BE PROVIDED AS REQUIRED PRIOR TO ISSUANCE OF BUILDING PERMIT.
5. THE DEVELOPMENT LIES IN THE ANCHORAGE MIDDLETOWN FIRE DISTRICT.
6. IF PROPOSED, SIGNATURE ENTRANCE WALLS SHALL BE SUBMITTED TO AND APPROVED BY THE PLANNING STAFF PRIOR TO CONSTRUCTION PLAN APPROVAL AND THEY SHALL MEET THE REQUIREMENTS OF CHAPTER 4.4.3 OF THE LDC.
7. ALL LUMINAIRES SHALL BE AIMED, DIRECTED OR FOCUSED SUCH AS TO NOT CAUSE DIRECT LIGHT FROM THE LUMINAIRE TO BE DIRECTED TOWARDS RESIDENTIAL USES OR PROJECTED OPEN SPACES (IE. CONSERVATION EASEMENTS, GREENWAYS OR PARKWAYS) ON ADJACENT OR NEARBY PARCEL'S, OR TO CREATE GLARE PERCEPTIBLE ON PUBLIC STREETS AND RIGHT–OF–WAYS PER CHAPTER 4.1.3. OF THE LDC.
8. MITIGATION MEASURES FOR DUST CONTROL SHALL BE IN PLACE DURING CONSTRUCTION TO PREVENT FUGITIVE EMISSIONS REACHING EXISTING ROADS AND NEIGHBORHOODS.
9. ALL EXISTING STRUCTURES AND EXISTING ENTRANCES SHALL BE REMOVED, EXCEPT AS NOTED ON THE PLAN.
10. IN ACCORDANCE WITH CHAPTER 4.9 OF THE LDC, A KARST SURVEY WAS PERFORMED BY WILLIAM GRANT HESS, P.G. AND LIZ NEWCOMB, P.E. ON 05/20/22 AND KARST TOPOGRAPHY WAS FOUND. A REVIEW OF PUBLISHED GEOLOGIC INFORMATION FROM THE KY GEOLOGICAL SURVEY CONTAINED INDICATION OF SINKHOLES ON THE SUBJECT PROPERTY, WHICH HAVE BEEN VISUALLY CONFIRMED. THERE WILL BE A NEED TO REMEDIATE SINKHOLES DURING CONSTRUCTION OF THIS SITE AND IT IS RECOMMENDED TO HAVE A GEOTECHNICAL CONSULTANT FAMILIAR WITH THE SITE ON–HAND TO CALL WHEN SINKHOLES ARE ENCOUNTERED. CARE SHOULD BE TAKEN TO PROPERLY REMEDIATE SINKHOLES, PER THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS, CARE SHOULD ALSO BE TAKEN DURING EARTHWORK TO INVESTIGATE AND REMEDIATE ANYTIME A POTENTIAL KARST FEATURE IS ENCOUNTERED. IT WILL BE IMPORTANT TO PROOFROLL THOROUGHLY BEFORE PLACING FILL AND AFTER CUTTING.
11. STREET TREES SHALL BE PLANTED IN A MANNER THAT DOES NOT AFFECT PUBLIC SAFETY AND MAINTAINS PROPER SIGHT DISTANCE. FINAL LOCATION WILL BE DETERMINED DURING CONSTRUCTION APPROVAL PROCESS.
12. WHEEL STOPS AND PROTECTIVE CURBING. CONCRETE WHEEL STOPS OR CURBING AT LEAST SIX (6) INCHES HIGH AND SIX (6) INCHES WIDE SHALL BE PROVIDED TO PREVENT VEHICLES FROM OVERHANGING ABUTTING SIDEWALKS, PROPERTIES OR PUBLIC RIGHTS–OF–WAY, TO PROTECT LANDSCAPED AREAS AND TO PROTECT ADJACENT PROPERTIES. SUCH WHEEL STOPS OR CURBING SHALL BE LOCATED AT LEAST THREE (3) FEET FROM ANY ADJACENT WALL, FENCE, PROPERTY LINE, WOODY VEGETATION, WALKWAY OR STRUCTURE.

MSD NOTES:

1. CONSTRUCTION PLANS & DOCUMENTS SHALL COMPLY WITH LOUISVILLE AND JEFFERSON COUNTY METROPOLITAN SEWER DISTRICT'S DESIGN MANUAL AND STANDARD SPECIFICATIONS.
2. WASTEWATER:
   SANITARY SEWER WILL CONNECT TO THE FLOYD'S FORK WASTEWATER TREATMENT PLANT BY LATERAL EXTENSION AGREEMENT, SUBJECT TO FEES. SANITARY SEWER CAPACITY TO BE APPROVED BY METROPOLITAN SEWER DISTRICT.
3. DRAINAGE/STORMWATER DETENTION:
   DETENTION TO BE PROVIDED ON SITE AS DEPICTED ON THE PLAN. POST–DEVELOPMENT PEAK FLOWS WILL NOT EXCEED PRE–DEVELOPED PEAK FLOWS FROM DEVELOPMENT FOR THE 2, 10, 25, AND 100 YEAR STORMS OR TO DOWNSTREAM CAPACITY, WHICH IS MORE RESTRICTIVE. DRAINAGE PATTERN (DEPICTED BY FLOW ARROWS) IS FOR THE CONCEPT PURPOSES ONLY. FINAL CONFIGURATION AND SIZE OF DRAINAGE PIPES AND CHANNELS SHALL BE DETERMINED DURING THE CONSTRUCTION PLAN DESIGN PROCESS. DRAINAGE FACILITIES SHALL CONFORM TO MSD REQUIREMENTS.
4. EROSION AND SILT CONTROL:
   A SOIL AND SEDIMENTATION CONTROL PLAN SHALL BE DEVELOPED AND IMPLEMENTED IN ACCORDANCE WITH MSD AND THE USDA NATURAL RESOURCES CONSERVATION SERVICE RECOMMENDATIONS.
5. A PORTION OF THE SUBJECT PROPERTY LIES WITHIN A FLOOD HAZARD AREA PER FEMA'S FIRM MAPPING (21111C0 0356E).
6. THE FINAL DESIGN OF THIS PROJECT MUST MEET ALL MS4 WATER QUALITY REGULATIONS ESTABLISHED BY MSD. SITE LAYOUT MAY CHANGE AT DESIGN PHASE DUE TO PROPER SIZING OF GREEN BEST MANAGEMENT PRACTICES.
7. KDOW APPROVAL PRIOR TO MSD CONSTRUCTION PLAN APPROVAL.
8. MSD FLOODPLAIN PERMIT REQUIRED. ANY REQUIRED FILL IN THE FLOODPLAIN SHALL BE MITIGATED ONSITE BELOW THE FEMA FLOODPLAIN. ANY FILL IN THE FLOODPLAIN SHALL BE COMPENSATED ONSITE AT 1.5 TO 1.
9. TRACT 2 WILL REQUIRE A DETAILED DEVELOPMENT PLAN TO ADDRESS THROUGH DRAINAGE PRIOR TO CONSTRUCTION PLAN APPROVAL.

PUBLIC WORKS AND KTC NOTES:

1. NO LANDSCAPING AND COMMERCIAL SIGNS SHALL BE PERMITTED IN STATE AND METRO WORKS RIGHT–OF–WAY.
2. RIGHT–OF–WAY DEDICATION BY DEED OR MINOR PLAT MUST BE RECORDED PRIOR TO SITE CONSTRUCTION APPROVAL BY PUBLIC WORKS OR WITH ASSOCIATED RECORD PLAT AS REQUIRED BY METRO PUBLIC WORKS.
3. COMPATIBLE UTILITY LINES (ELECTRIC, PHONE, CABLE) SHALL BE PLACED IN A COMMON TRENCH UNLESS OTHERWISE REQUIRED BY APPROPRIATE AGENCIES.
4. STREET TREES SHALL BE PLANTED IN A MANNER THAT DOES NOT AFFECT PUBLIC SAFETY AND MAINTAINS PROPER SIGHT DISTANCE. FINAL LOCATION WILL BE DETERMINED DURING CONSTRUCTION APPROVAL PROCESS.
5. AN ENCROACHMENT PERMIT AND BOND MAY BE REQUIRED BY METRO PUBLIC WORKS FOR ROADWAY REPAIRS ON ALL SURROUNDING ACCESS ROADS TO THE SITE DUE TO DAMAGES CAUSED BY CONSTRUCTION TRAFFIC ACTIVITIES.
6. THE DEVELOPER IS RESPONSIBLE FOR ANY UTILITY RELOCATION ON THE PROPERTY.
7. TREES AND SHRUBBERY SHALL BE TRIMMED OR REMOVED TO PROVIDE SIGHT DISTANCE AS REQUIRED PER METRO PUBLIC WORKS STANDARDS.
8. ALL SIDEWALK RAMPS SHALL CONFORM TO A.D.A. STANDARD SPECIFICATION, THE "SPECIAL NOTE FOR DETECTABLE WARNING FOR SIDEWALK RAMPS" PER KTC STANDARD DRAWING FOR SIDEWALKS AND PER "KENTUCKY STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," LATEST EDITION.

DETENTION CALCULATIONS

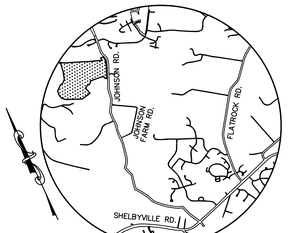
2.9/12 ("POST C"–"PRE C") ("ACRES") = XX AC–FT
2.9/12 (0.56 – 0.30) .35 = 2.19 AC–FT

BENCHMARKS

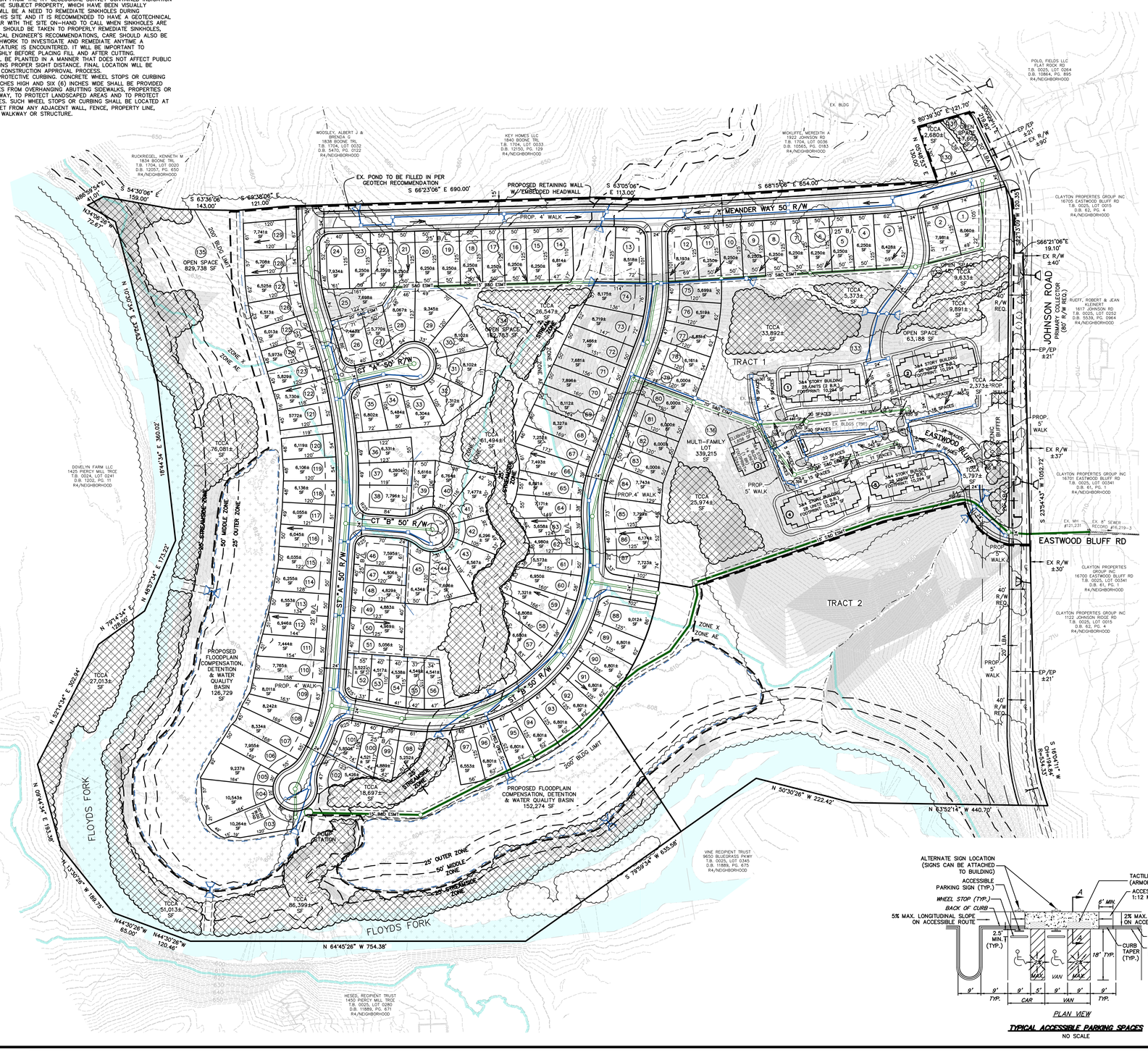
NOTE: ALL ELEVATIONS ARE BASED ON NAVD 1988 DATUM & WERE DERIVED FROM LOJIC BENCHMARKS BY MEANS OF GPS METHODS AND DIFFERENTIAL LEVELING.

SOURCE BENCHMARK STA037–2001 NAVD 1988 ELEV. 619.67

FROM THE INTERSECTION OF OLD HENRY ROAD AND BUSH FARM ROAD (FORMERLY AIKEN ROAD), TRAVEL 1.5 MILES ALONG BUSH FARM ROAD TO THE STATION ON THE LEFT, 90 FEET FROM THE ENTRANCE TO PINEGLIFF GARDENS.



LOCATION MAP
NO SCALE



SITE DATA:

FORM DISTRICT	NEIGHBORHOOD
EXISTING ZONING	R4
EXISTING LAND USE	VACANT/AGRICULTURAL
PROPOSED LAND USE	SINGLE & MULTI–FAMILY RESIDENTIAL (MRDI)
GROSS LAND AREA	72.55± AC
TRACT 1	61.10± AC
TRACT 2	11.45± AC (NOT INCLUDED IN PROPOSED DEVELOPMENT)
NET LAND AREA	54.92± AC
TOTAL NUMBER OF UNITS	242 UNITS
SINGLE–FAMILY	130 LOTS
MULTI–FAMILY	112 UNITS
GROSS DENSITY	3.96 D.U./AC.
NET DENSITY	4.52 D.U./AC*
TOTAL OPEN SPACE PROVIDED	29.12± AC

AVERAGE LOT SIZE CALCULATION:
TOTAL BUILDABLE LOT AREAS/TOTAL BUILDABLE LOTS
1,214,387± SF/131(INCLUDES MULTI–FAMILY LOT) 9,270± SF

MIXED RESIDENTIAL DEVELOPMENT INCENTIVE (MRDI) POINTS:

% MULTI–FAMILY UNITS:	47%	2 POINTS
% AFFORDABLE UNITS:	12 (5%)	1 POINT
% COMMON OPEN SPACE	44%	3 POINTS
< 15% BELOW POVERTY LEVEL	6.03%	2 POINTS
TOTAL		8 POINTS

*8 POINTS = 5% DENSITY BONUS = 5.08 DU/AC ALLOWED IN R–4

SITE DATA:SINGLE–FAMILY RESIDENTIAL (LOTS 1–130)

BUILDABLE LOTS	130
NON–BUILDABLE LOTS	4
BUILDING HEIGHT (35' MAX. ALLOWED)	---
DIMENSIONAL STANDARDS:	
MINIMUM LOT SIZE	4,500 SF (9,000 SF AVG)
MINIMUM LOT WIDTH	40'
FRONT YARD & STREET SIDE YARD	15' (25' IF GARAGE FACING STREET)
SIDE YARD	5'
REAR YARD MIN.	25'

SITE DATA: MULTI–FAMILY RESIDENTIAL (LOT 136)

GROSS LAND AREA	7.79 AC (339,215 SF)
NET LAND AREA	7.79 AC (339,215 SF)
NUMBER OF DWELLING UNITS	112
GROSS FLOOR AREA	185,292 SF
BUILDING HEIGHT (35' MAX. ALLOWED)	---
DENSITY	14.38 D.U./AC.
OPEN SPACE REQUIRED	50,882 SF (15%)
OPEN SPACE PROVIDED	195,240 SF (57%)
REC. OPEN SPACE REQUIRED	25,441 (50% REQ'D OPEN SPACE)
REC. OPEN SPACE TO BE PROVIDED	------- SF (---%)
PARKING REQUIRED	
MINIMUM (1 SPACE/D.U.)	112 SPACE
MAXIMUM (2 SPACE/D.U.)	224 SPACES
PARKING PROVIDED	188 SPACES (INCLUDES 6 ADA SPACES)
CAR PARKING	1.67 SP./UNIT
PARKING AREA RATIO	

LANDSCAPE DATA:

V.U.A.	59,487 SF
I.L.A. REQUIRED	4,461 SF (7.5%)
I.L.A. PROVIDED	6,821 SF

SITE DATA TREE CANOPY:

GROSS SITE AREA	61.10± AC (2,661,157± SF)
PROPOSED LAND USE	SINGLE & MULTI–FAMILY RESIDENTIAL (MRDI)
EXISTING TREE CANOPY	910,757± SF (34%)
*TREE CANOPY TO BE PRESERVED	387,869± SF (14.6%)**
TOTAL TREE CANOPY REQUIRED	1,064,463± SF (40%)
TREE CANOPY TO BE PLANTED	676,594± SF (25.4%)

TREE CANOPY DEPICTED ON PLAN PER MSD LOJIC MAPPING, AERIAL PHOTO OR FIELD SURVEY. TREE CANOPY CALCULATIONS BASED UPON TREE AREAS SHOWN.

*IF DRIPLINE IS PLOTTED/FIELD LOCATED THE AREA OF CANOPY TO BE PLANTED MAY BE REDUCED BY THE EXISTING CANOPY TO BE PRESERVED PER 10.1.5.A.2 OF THE LDC.

**CREDIT DOUBLED FOR GROUND CHECKING EXISTING TREES PER LDC 10.1.5.A.2, SEE "TREE CANOPY DOCUMENTATION"

WAIVER REQUEST:

A WAIVER OF 7.3.30.E OF THE LDC IS REQUESTED TO ALLOW MORE THAN 15% OF A REQUIRED REAR YARD OF A BUILDABLE LOT TO BE OCCUPIED BY A DRAINAGE EASEMENT.

LEGEND

- EXISTING CONTOUR
- EXISTING TREE MASS
- EXISTING TREE
- EXISTING GUARDRAIL
- EXISTING FENCE
- EXISTING SANITARY MANHOLE W/PIPE
- PROPOSED TREE MASS
- PROPOSED HANDICAP SPACE
- PROPOSED CATCH BASIN & YARD DRAIN W/PIPE
- PROPOSED STORM MANHOLE W/PIPE
- PROPOSED HEADWALL W/PIPE
- PROPOSED WATER QUALITY UNIT W/PIPE
- PROPOSED DITCH/SWALE
- PROPOSED SANITARY MANHOLE W/PIPE
- PROPOSED FORCEMAIN
- PROPOSED TREE CANOPY CREDIT AREA
- PROPOSED DRAINAGE ARROW
- INTERIOR LANDSCAPE AREA (ILA)
- OPEN SPACE AREA
- LIMITS OF DISTURBANCE
- EXISTING SLOPES >20–30%
- EXISTING SLOPES >30%

PLAN VIEW

TYPICAL ACCESSIBLE PARKING SPACES
NO SCALE

GRAPHIC SCALE 1"=100'
0 50 100 200

CASE NUMBER: 22–MSUB–0004
MSD WM # 12241

STATE OF KENTUCKY — DAVID A. MINDEL 12,247 — LICENSED PROFESSIONAL ENGINEER
PROFESSIONAL'S SEAL

MINDEL SCOTT
SURVEYING ▶ PLANNING ▶ LANDSCAPE ARCHITECTURE
5151 Jaggie Fox Way ▶ Lexington, KY 40803
502–485–1508 ▶ MindelScott.com

DEVELOPER
HIGHGATES MANAGEMENT
7301 MONSEY CIRCLE
LOUISVILLE, KY 40219
HIGHGATES

OWNER
JEAN RUEFF
1617 JOHNSON ROAD
LOUISVILLE, KY 40245

PRELIMINARY SUBDIVISION PLAN
(MIXED RESIDENTIAL DEVELOPMENT INCENTIVE)

JOHNSON ROAD RESIDENTIAL

1614 JOHNSON ROAD
LOUISVILLE, KY 40245
T.B. 0025, LOT 0068
D.B. 6403, PG. 0333

Revisions:	
08/01/22	AGENCY COMMENTS
10/03/22	AGENCY COMMENTS

Vertical Scale: N/A
Horizontal Scale: 1"=100'
Date: 03/07/22
Job Number: 3622

Sheet 1 of 1

M:\3622\1614 JOHNSON ROAD\DWG\PLANNING\3622 - MRDI-11-07-22.dwg, 11/8/2022 8:55:27 AM, dbaker, 1:1

May 20, 2022

Mr. Joseph Waldman
Highgates Management
119 Park Glen Avenue
Toronto, Ontario, Canada M6B2C6

Reference: **Preliminary Slope Evaluation & Karst Survey – Johnson Road Residential**
1614 Johnson Road
Louisville, Jefferson County, Kentucky 40245
ECS Project No. 61-2735

Dear Mr. Waldman:

ECS Southeast, LLP (ECS) conducted a preliminary slope evaluation and karst survey for the referenced site in accordance with ECS Proposal No. 61-P2677, dated March 31, 2022. This evaluation included the following elements: a review of provided drawings; a review of soil survey information; a review of geologic maps; a review of topographic maps; a visual reconnaissance of site conditions for the karst geologic features defined in the Metro Louisville Land Development Code (LDC); a review of current and historical aerial photographs; a visual reconnaissance of indicated steeper slope areas that would be disturbed by new construction; and evaluate the reviewed information and prepare a report of our findings and recommendation.

Project Information

The proposed development on-site includes 124 single-family residential lots, 4 multi-family residential buildings, and associated roadways. There is approximately 100 feet of fall across the entire site, with up to approximately 22 feet of fall across a single proposed residential development lot. The existing topography generally sloped down from east to west and north to south towards the existing stream.

The existing site consisted approximately 61.09 acres of open rolling hills, densely wooded areas, several drainage swales and small streams, ponds, with relatively flat areas followed by steep slopes near the existing stream (Floyds Fork). Residential buildings (house, barn, and shed) were present in the northeast portion of the site at 1614 Johnson Road in Louisville, Kentucky. The "3622 - PREPLAN - 3-30-2022-with slopes" provided by Kathy Linares of Mindel Scott via email, dated March 30, 2022, identified existing 20-30% slopes and >30% slopes on the property. A reduced copy of this drawing is attached to this report.

The current LDC section 4.7.5 includes requirements for land disturbing activities on slopes greater than 20%. Item B.3 of section 4.7.5 states "Land disturbing activities on slopes greater than 20% and less than 30% shall be required to prepare a geotechnical survey report if the staff of the USDA Natural Resources Conservation Service (NRCS) determines such a study is warranted, given the site's soil and geologic characteristics. A geotechnical survey report shall be submitted for land disturbing activities on slopes greater than 30%." We understand that at present the NRCS is not making the determination of the need for a geotechnical survey report. Accordingly, ECS Southeast, LLP (ECS) was retained to conduct an initial slope evaluation of the site and to determine if additional geotechnical exploration/analyses would be required. Our evaluation consisted of the following tasks:

- Review the Plan
- Review USGS Geologic Quadrangle Map information
- Review USDA NRCS Soil Survey information
- Conduct a visual reconnaissance of indicated steeper slope areas that would be disturbed by new construction
- Evaluate the reviewed information and prepare a report of our findings and recommendations

Geology

The following geologic information is based on the review of: the Crestwood, 24K Quadrangle, Geologic Map, Kentucky, published by the United States Geological Survey (USGS); information (aerial photos, geologic maps, and topographic maps, etc.) obtained from the Kentucky Geological Survey (KGS) Geologic Information Service website; and Google Earth Satellite Imaging.

The Kentucky Geologic Map Information Service website indicated that the majority of the proposed development area was underlain Drakes Formation and was overlain by Alluvium deposits in the flatter/lower lying southwestern portion of the site. The majority of the steep slope areas were underlain directly by Drakes Formation (roughly above ~EL 610 to ~EL 620), with the remainder of the site underlain by Alluvium (roughly below ~EL 610 to ~EL 620).

Above	~EL 610 – 620	Drakes Formation
Below	~EL 610 – 620	Alluvium

Figure 1: Reported Site Geology

Alluvium (Floyds Fork Depositional Plain)
Total Reported Thickness: 0 – 15 feet
Karst Potential: Non-Karst

Primarily Silt and clay. Alluvium of flood plains is mainly brown to dark grayish brown silty sand and clayey silt, contains lenses, stringers, and a persistent basal layer of sand and gravel. Sand and granules are mostly limonite pellets derived from soil; coarser pebbles, cobbles, and slabby boulders are from local bedrock. Common thickness along Floyds Fork is 8 to 10 feet; less along smaller streams. Floyds Fork and Long Run flow mainly on bedrock, except for small point bars, even where bordered by alluvium. Older alluvium on terraces 30 to 45 feet above Floyds Fork.

Drakes Formation (Uplands and Most Slope Areas)
Total Reported Thickness: ± 140 feet
Karst Potential: Low
Primary Lithology: Limestone, dolomite, and/or shale.
Members: Hitz Limestone Bed; Saluda Dolomite Member; Bardstown Member; and Rowland Member.

Hitz Limestone Bed: Primarily limestone, dolomite, and shale. Limestone and dolomite are dark gray to olive gray, weather light gray to grayish orange, locally with reddish brown cast; very fine to medium grained, silty; laminated in part; sub-conchoidal to hackly fracture; inter-bedded and inter-graded. Shale, greenish-gray to brownish black, calcareous, in part carbonaceous, as partings or interbeds as much as 0.3 foot thick.

Saluda Dolomite Member: Primarily dolomite, dolomitic mudstone, with minor shale and limestone. Dolomite is greenish gray to olive gray, weathers same to yellowish gray and dark yellowish orange. Shale, light gray to olive black, locally carbonaceous; as persistent parting 0.1 to about 1 foot thick in lower part of laminated dolomite, generally 12 to 16 feet above base of unit. Limestone is bluish gray, weathers olive gray to brownish gray; dense, micritic; conchoidal fracture; commonly as a single bed immediately below or above shale marker bed and as one or two thin beds in lower part of unit.

Bardstown Member: Primarily limestone and shaly mudstone. Limestone, medium to olive gray, is of two main types: shaly limestone and coquinoidal limestone. Shaly limestone is fine to very fine grained, contains sparse to abundant coarse grains and fossil fragments, grades locally to calcareous shale. Coquinoidal limestone is characterized by fossils fragments in a sparry to muddy matrix; bluish cast common where fresh, weathers yellowish gray, dark yellowish orange, and light olive gray. Shaly mudstone, thin bedded, mainly calcareous, olive gray to greenish gray; locally dark brownish gray to olive black where carbonaceous.

Rowland Member: Primarily limestone and shale. Dominant limestone is medium and greenish gray to medium bluish gray calcisiltite; weathers pale olive to yellowish gray; dolomitic and argillaceous; streaked with irregular burrows filled with dusky yellowish-green glauconitic material which weathers out readily to form holes and pitted bed surfaces; thin to thick bedded in continuous but poorly defined planar beds. Dominant shale is olive gray, light olive gray, greenish gray, and dark greenish gray; weathers yellowish gray to light gray; calcareous; in beds as much as 3 feet thick near upper and basal contacts. Small ponds for livestock and recreation are common in areas underlain by the Waldron Shale and by shale of the Osgood Formation and the Bardstown and Rowland Members of the Drakes Formation

Karst Potential
According to the KGS Karst Potential Classification definitions, formations designated with a "Low" karst potential are where the development of karst features are poorly developed or absent with the formations described as "siliciclastic units with minor limestone beds or units primarily composed of dolomite". Formations designated with a "Non-Karst" karst potential are described as "Consolidated or unconsolidated siliclastic units. Karst features are rare or absent." The karst potential is based on the tendency for the site to develop or have karst features as shown on the Kentucky Geologic Map Information Service and is not necessarily indicative of the actual presence or absence of karst activity at the site.

No sinkholes were mapped on the site by the Kentucky Geologic Map Information Service. However, several sinkholes were reported approximately 1,000 to 1,500 feet north and west from the site. A water well was reported approximately 150 feet northeast of the existing barn in the north central portion of the site. No remaining information (e.g. depth to rock, static water level, etc.) was reported for the water well. Refer to attached **Karst Potential Map(s)** for approximate location of mapped features.

A site reconnaissance was conducted on May 4-5, 2022, by William "Grant" Hess, P.G. of ECS. Rock outcropping was encountered along the base of the north and east bank of Floyds Fork (~ EL 600 to ~EL 610). No definitive closed

depressions related to karst activity (several apparent animal burrows were encountered) were observed at the time of this evaluation. However, flowing water was observed near the reported well water and was labeled for the purposes of this report as an apparent spring. The apparent spring area consisted of a "collapsed" area where flowing water was observed at the base and continued along a drainage swale. Refer to the attached **Site Reconnaissance Plan** for the approximate locations.

Soil Conservation Service Soil Survey

The USDA Natural Resources Conservation Service "Web Soil Survey" website indicated 9 general soil types (excluding water unit "W") at the site as shown in **Figure 2**. Descriptions of these soil types are summarized below.

NRCS CUSTOM SOIL RESOURCE REPORT				
Map Unit Symbol	**Map Unit Name**	**Parent Material**	**Acres in AOI (Approximate)**	**Percent of AOI (Approximate)**
BeB	Beasley silt loam, 2 to 6 percent slopes.	Clayey residuum weathered from calcareous shale.	3.2	5.4%
BeC	Beasley silt loam, 6 to 12 percent slopes.	Clayey residuum weathered from calcareous shale and/or calcareous siltstone.	4.6	7.8%
EoB	Elk silt loam, 2 to 6 percent slopes, occasionally flooded.	Mixed fine-silty alluvium.	11.0	18.8%
FaD	Faywood silt loam, 12 to 25 percent slopes.	Clayey residuum weathered from limestone and shale.	19.6	33.5%
FsF	Faywood-Shrouts-Beasley complex, 25 to 50 percent slopes.	Clayey residuum weathered from limestone and shale.	0.1	0.1%
NhB	Nicholson silt loam, 2 to 6 percent slopes.	Fine-silty noncalcareous loess over clayey residuum weathered from limestone.	0.0	0.1%
No	Nolin silt loam, 0 to 2 percent slopes, occasionally flooded.	Mixed fine-silty alluvium.	15.5	26.5%
OwC	Otwood silt loam, 6 to 12 percent slopes, occasionally flooded.	Mixed fine-silty alluvium over mixed loamy alluvium.	2.4	4.1%
UkC	Urban land-Alfic Udarents-Beasley complex, 0 to 12 percent slopes	Clayey residuum weathered from calcareous shale and/or calcareous siltstone.	0.1	0.2%
W	Water.	Water.	2.0	3.5%

Figure 2: Reported Soil Data

Site Reconnaissance

Based on our review of the provided drawing, the north and east portions of the site included either 20-30% slopes or >30% slopes that may be disturbed during development. A site reconnaissance was conducted on May 4-5, 2022, by William "Grant" Hess, P.G. of ECS. Refer to the attached **Site Reconnaissance Plan** for the approximate locations. Steep slopes with numerous displaced gravel, cobbles, and/or and boulder-sized rock, eroded/mounded soil, and various indications of minor slope instability were observed along the northern and eastern portions of the site and typically became more prevalent within 100 feet of the existing drainage swales and streams. A relatively flat depositional plain was observed in the southwest portion of the site with steep slopes encountered along Floyds Fork.

Surface drainage generally was directed to the south and west across the site by the existing topography and drainage swales and small streams. An existing stream approximately 10 to 30 feet wide, located in the center of the site, and extended north to south for the length of the site to Floyds Fork. Several drainage swales were observed intersecting the central stream and/or Floyds Fork. Indications of erosion were observed primarily along the swales including occasional patches of bare soil and gullies. Three ponds with associated apparent man-made berms were observed in the northern portion of the site.

Some visual indications of minor slope instability and evidence of creep were observed in the north and east portions including: displaced rock fragments (gravel, cobbles, and/or boulders); unusual tilting, bowed, and fallen trees; minor eroded soil; and mounding of the eroded soil at the slope base and upslope of larger trees. No indications of large, wide-scale or deep seated slope movements were noted. However, minor slope movements (wedge, bowl, or disk shaped failures) were observed in isolated areas (typically at slope areas > 20%). For the remainder of the site (low lying portion), the slopes appeared to be stable (excluding stream and drainage swale banks). In general, signs of slope failure became rare or absent in areas south and west of the steep slopes. See below for photos at each area observed as shown on the attached **Site Reconnaissance Plan.**

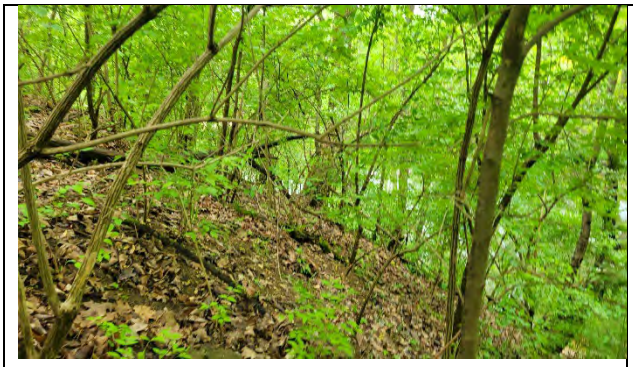


Photo 1: View of slope and tilted trees (Slope Area 1).

Photo 2: View of drainage swale (Slope Area 1).

Photo 3: View of displaced cobbles (Slope Area 2).

Photo 4: View of slope and tilted trees (Slope Area 2).

Photo 5: View of slope and outcropping (Slope Area 3).

Photo 6: View of outcropping and Floyds Fork (Slope Area 4).

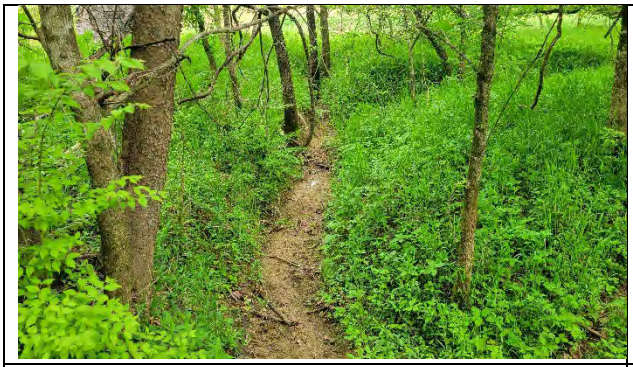


Photo 7: View of drainage swale (Slope Area 5).

Photo 8: View of drainage swale (Slope Area 5).

Photo 9: View of pond (Slope Area 6).

Photo 10: View of soil mounding (Slope Area 6).

Photo 11: View of soil mounding, displaced cobbles, and minor erosion (Slope Area 7).

Photo 12: View of soil mounding and slope (Slope Area 7).

Photo 13: View of displaced cobbles (Slope Area 7).

Photo 14: View of tilted trees and slope (Slope Area 8).

Photo 15: View of soil mounding (Slope Area 8).

Photo 16: View of bowed trees and slope (Slope Area 8).

Photo 17: View of drainage swale and slope (Slope Area 8).

Photo 18: View of soil mounding and minor erosion (Slope Area 9).

Photo 19: View of minor erosion and slope failure "wedge shaped" (Slope Area 9).

Photo 20: View of minor erosion and tree tilting (Slope Area 9).

Photo 21: View of pond (Slope Area 9).

Photo 22: View of slope (Slope Area 10).

Photo 23: View of soil mounding, displaced cobbles, and minor erosion (Slope Area 10).

Photo 24: View of soil mounding, displaced cobbles, and minor erosion (Slope Area 10).

Photo 25: View of soil mounding (Slope Area 10).

Photo 26: View of minor erosion, mounding, and "wedge shaped" slope failure (Slope Area 10).

Photo 27: View of soil mounding, displaced cobbles, and minor erosion (Slope Area 10).

Photo 28: View of culvert and drainage swale (Slope Area 11).

Photo 29: View of bowed trees and slope (Slope Area 11).

Photo 30: View of slope (Slope Area 12).

Photo 31: View of culvert and drainage swale (Slope Area 12).

Photo 32: View of "bowl shaped" slope failure (Slope Area 13).

Photo 33: View of "bowl shaped" slope failure (Slope Area 13).

Photo 34: View of tilted trees and drainage swale (Slope Area 13).

Photo 35: View of slope (Slope Area 13).

Photo 36: View of soil mounding and minor erosion (Slope Area 13).

Photo 37: View of drainage swale (Slope Area 13).

Photo 38: View of drainage swale (Slope Area 13).

Photo 39: View of slope (Slope Area 14).

Photo 40: View of apparent spring (upslope).

Photo 41: View of apparent spring (downslope).

Photo 42: View of central stream (upstream).

Photo 43: View of central stream (downstream).

Photo 44: View of central stream (downstream).

Based on our review of the above reference observations and information, and on our past experience with site development for similar conditions in Jefferson County, our opinion is that most of the on-site slopes (excluding small, localized erosion features along swales and streams) in the observed areas were generally stable at the time of our reconnaissance. Evidence of minor instability was observed in isolated areas in the north and east portions of the site (Slope Areas).

The current, on-site localized slope instability observed likely is related to the following factors:

- Relatively thin depths of soil in slope areas
- Cohesive (clayey) soil matrix
- Rocky soil texture
- Limestone, dolomite, and or shale bedrock
- Numerous trees and other vegetation

Based on the conditions observed, our opinion is that additional geotechnical exploration/analyses including soil/rock test borings/coring, shear strength tests of soils, etc. are not required for most of the evaluated on-site slopes, provided that the planned subdivision is designed and constructed utilizing the guidelines included in this report.

The north and east portions of the site, as shown in the shaded ("Observed Slope Areas" and "Minor Failure Areas") where minor instability was observed should be further investigated during the construction phase of the project once the location and planned elevation of the proposed structures and related improvements are known.

The following guidelines should be used to help maintain the stability of the existing and planned slopes during the design and construction of the new subdivision, and over the life of the new homes. These guidelines include:

- Plan grading to minimize changes to existing topography along slopes.
- Minimize disturbance to slopes and vegetation outside new construction areas.
- Avoid significant transverse cuts along face or at the toe of existing slopes.
- Avoid significant embankments on the face, or along or at the crest of existing slopes.
- Avoid placing new construction at or within 10 feet of the crest of existing slopes.
- Maintain the following limits for new embankments without additional geotechnical exploration and analysis:
  - 3:1 (horizontal: vertical) or flatter slopes.
  - Properly strip all vegetation, topsoil, etc. where fill will be placed.
  - Construct embankments with controlled fill compacted to at least 98 percent of the Standard Proctor maximum dry density and within 2 percent of the optimum moisture content.
  - Maximum fill embankment height – 5 feet.
  - Horizontally bench new fill into existing slopes in maximum one-foot vertical steps.
- Maintain the following limits for new cuts in soil without additional geotechnical exploration and analysis:
  - 3:1 (horizontal: vertical) or flatter slopes.
  - Maximum cut height – 5 feet.
- Provide adequate erosion and surface water drainage control during construction and over the life of the subdivision.
- Establish permanent vegetative cover as soon as practical.

Closing

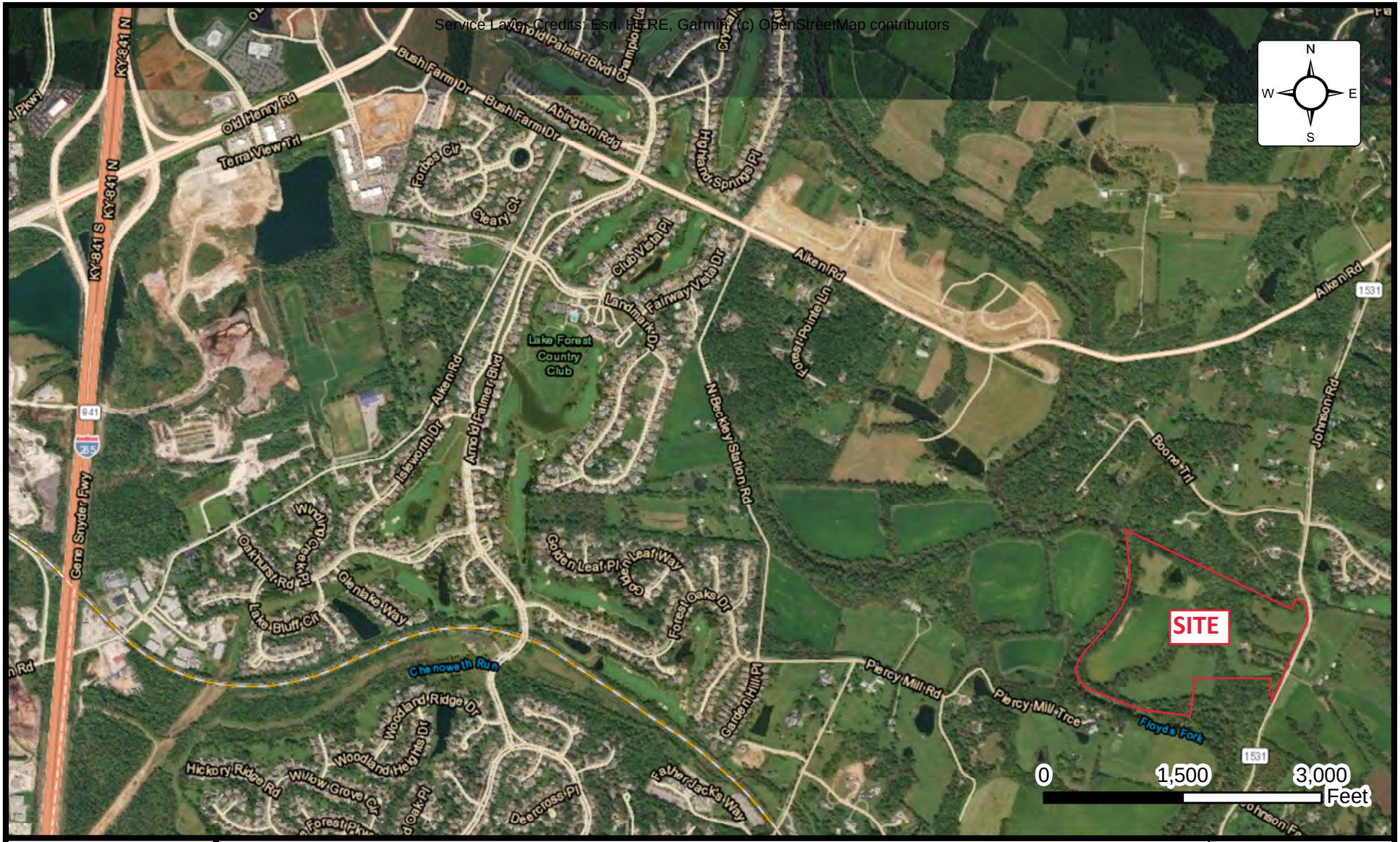
We appreciate the opportunity to serve as your geotechnical consultants for this project. We look forward to future association with you on this and other projects.

Respectfully submitted,
ECS Southeast, LLP

William "Grant" Hess, P.G.
Project Geologist
ghess@ecslimited.com

Liz Blandford Newcomb, P.E.
Principal Engineer
lnewcomb@ecslimited.com

Attachments: Site Vicinity Diagram
Geology Location Plan
Karst Potential Map – 1
Karst Potential Map – 2
Site Reconnaissance Plan
3622 - PREPLAN - 3-30-2022-with slopes



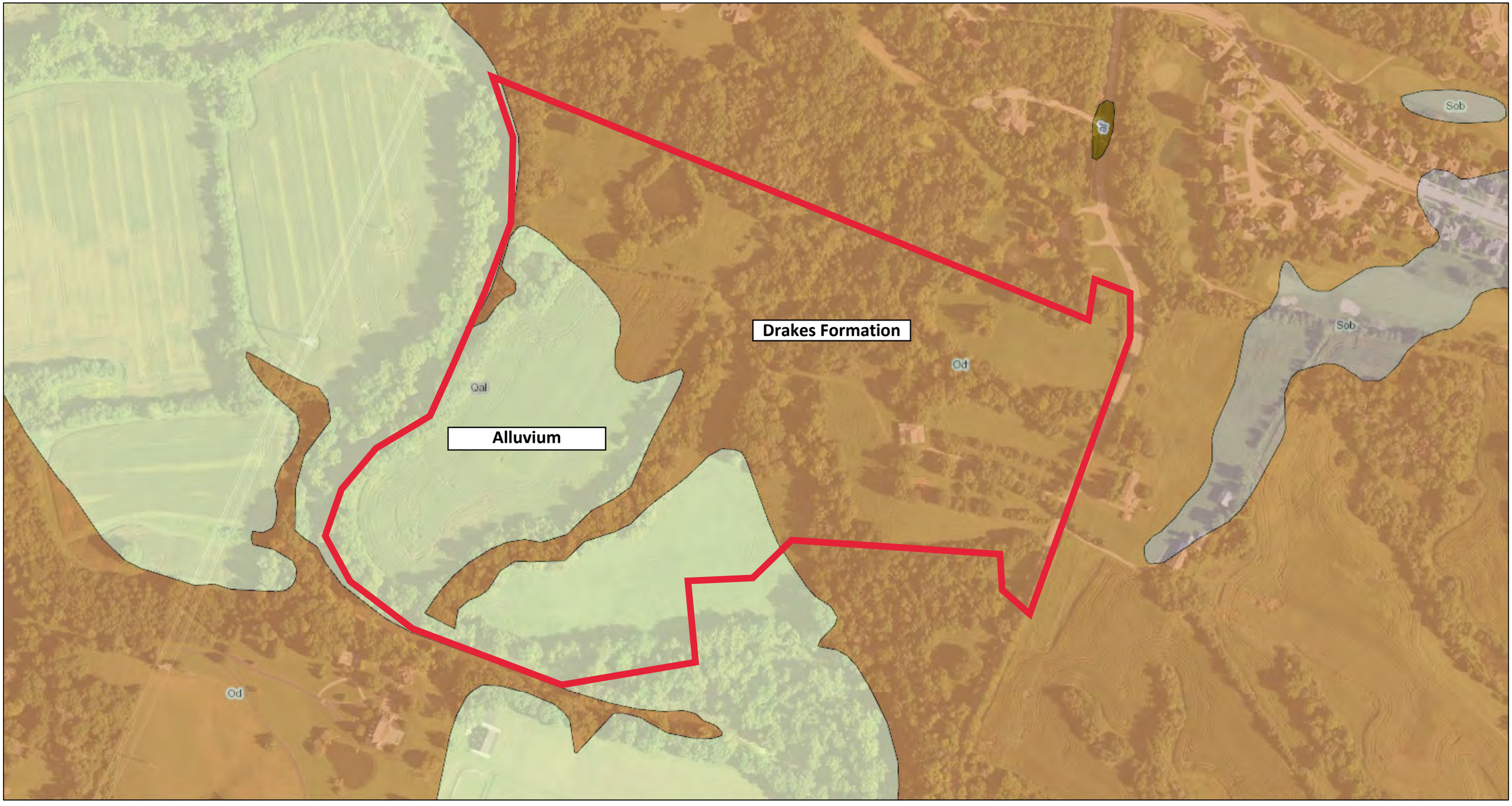
SITE LOCATION DIAGRAM

PRELIMINARY SLOPE EVALUATION & KARST SURVEY
JOHNSON ROAD RESIDENTIAL

1614 JOHNSON RD, LOUISVILLE, KENTUCKY

ENGINEER	FEN
SCALE	AS NOTED
PROJECT NO.	61-2735
SHEET	1 OF 1
DATE	5/12/2022

Kentucky Geologic Map Information Service - Geology Location Diagram



May 12, 2022

1:4,514

0 0.05 0.1 0.2 mi
0 0.075 0.15 0.3 km

Kentucky Geological Survey

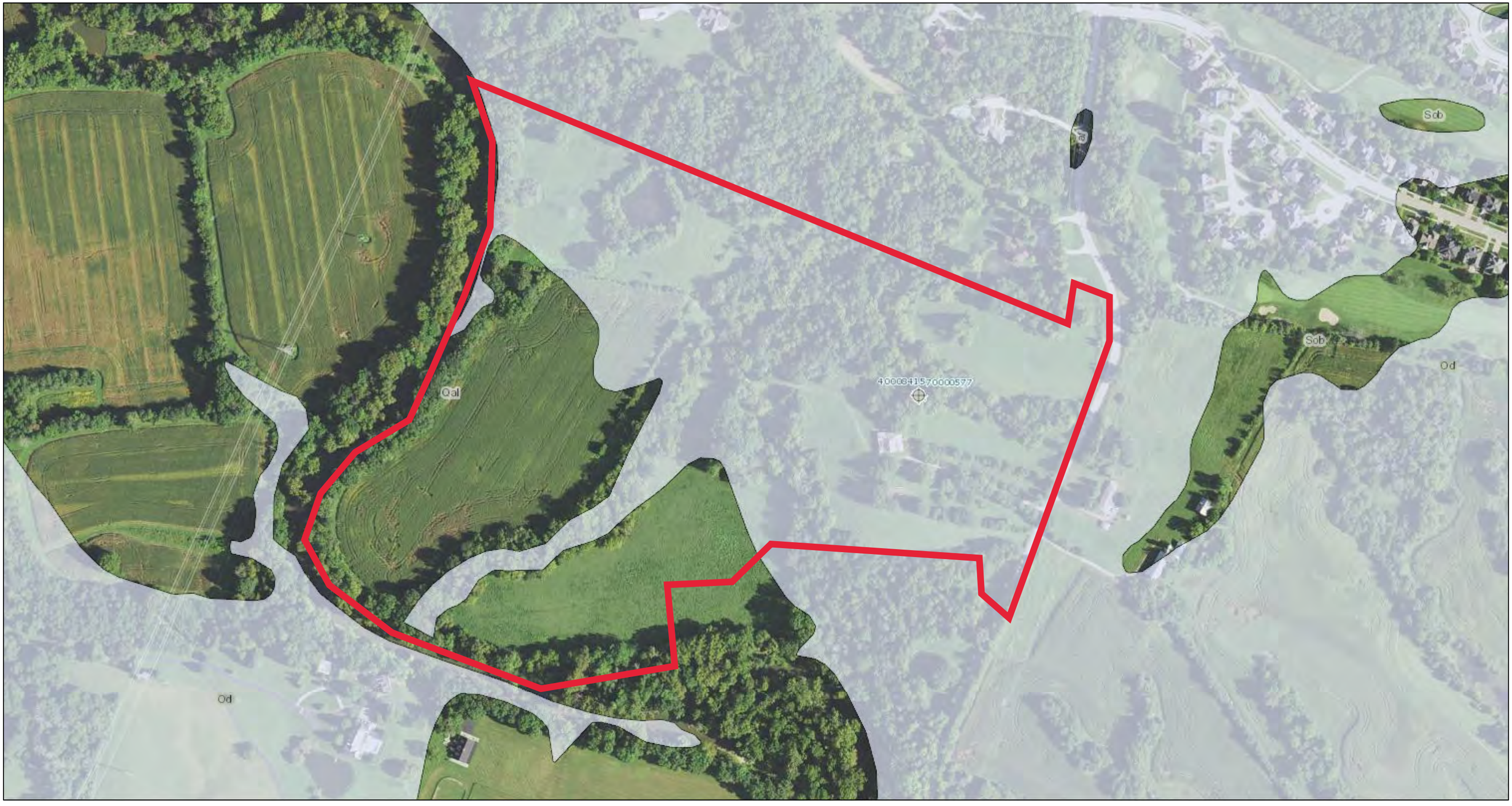
1:24,000 scale data (detailed geology)
This legend includes all units from the 1:24,000 quadrangles in the current view. Some units on the legend may not appear on the map.

Qal **Alluvium**
(Quaternary - Quaternary)

Od **Drakes Formation**
(Upper Ordovician - Upper Ordovician)

author: Kentucky Geological Survey
copyright Kentucky Geological Survey

Karst Potential Map - 1



May 12, 2022

1:4,514

0 0.05 0.1 0.2 mi

0 0.075 0.15 0.3 km

Kentucky Geological Survey

Karst Potential Units

- very high
- high
- medium
- low
- non-karst

LiDAR Sinkholes

KGS Sinkholes

Kentucky Sinkhole Outlines

- Sinkhole

Kentucky Water Wells

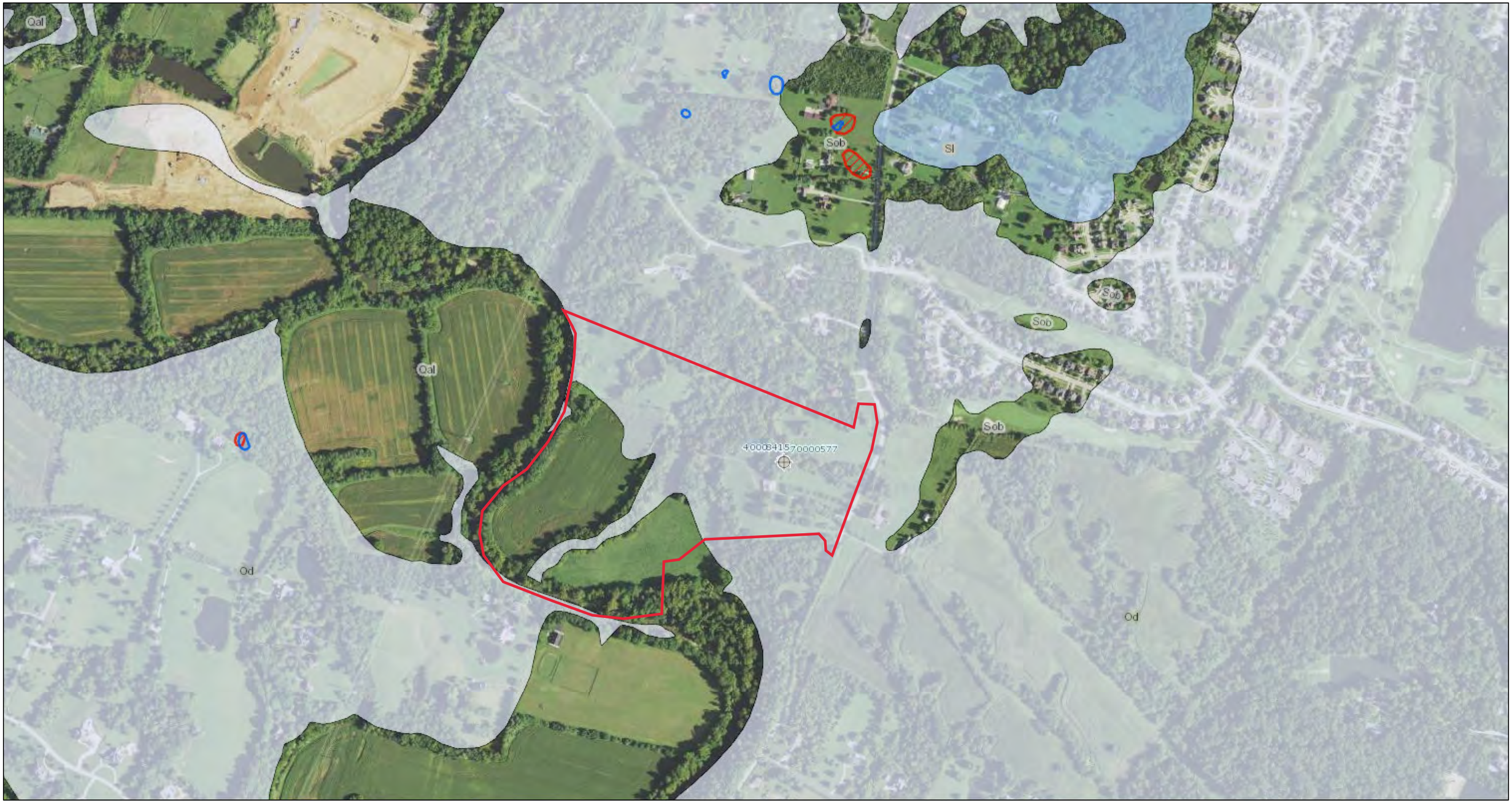
- Other

Kentucky Springs

- Spring

author: Kentucky Geological Survey
copyright Kentucky Geological Survey

Karst Potential Map - 2



May 19, 2022

1:9,028

0 0.1 0.2 0.4 mi

0 0.175 0.35 0.7 km

Kentucky Geological Survey

Karst Potential Units

- very high
- high
- medium
- low
- non-karst

LiDAR Sinkholes

KGS Sinkholes

Kentucky Sinkhole Outlines

- Sinkhole

Kentucky Water Wells

- Other

Kentucky Springs

- Spring

author: Kentucky Geological Survey
copyright Kentucky Geological Survey

LEGEND

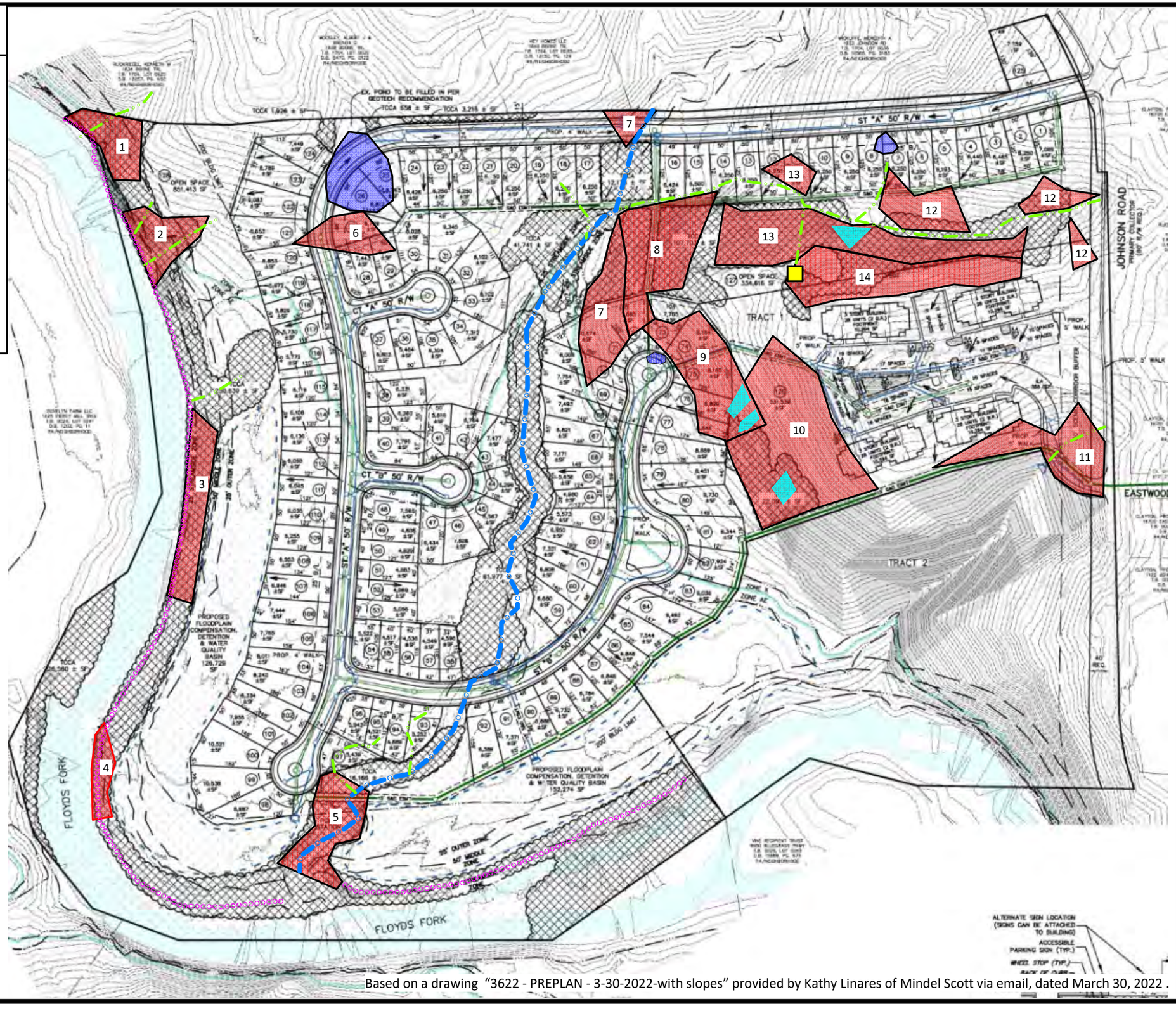
- 1 - Observed Slope Areas
- - Minor Failure Areas
- - Central Stream
- - Drainage Swale
- - Apparent Spring
- - Existing Pond
- - Rock Outcropping

Notes:
Locations are approximate.

Some location numbers are duplicated due to proximity and/or observed consistency.

Graphic Scale

0' 200' 400'



Based on a drawing "3622 - PREPLAN - 3-30-2022-with slopes" provided by Kathy Linares of Mindel Scott via email, dated March 30, 2022 .

Site Reconnaissance Plan
Preliminary Slope Evaluation & Karst Survey
Johnson Road Residential
1614 Johnson Road
Louisville, Jefferson County, Kentucky 40245

Drawn By: WGH
Checked By: FEN
Scale: As Shown

Project No.: 61-2735
Drawing No.: 2735
Date: 05/12/2022

ECS Southeast, LLP
1762 Watterson Trail
Louisville, Kentucky 40299
Tel. (502) 493-7100

GENERAL NOTES:

1. DOMESTIC WATER SUPPLY:
   SUBJECT SITE CAN BE SERVED BY THE LOUISVILLE WATER COMPANY. THE NECESSARY WATER SYSTEM IMPROVEMENTS REQUIRED TO SERVICE THE DEVELOPMENT SHALL BE AT THE OWNER/DEVELOPER'S EXPENSE.
2. TREE PRESERVATION:
   A TREE PRESERVATION PLAN SHALL BE PROVIDED TO THE PLANNING COMMISSION'S STAFF LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES ON THE SITE.
3. PROTECTION OF TREES TO BE PRESERVED:
   CONSTRUCTION FENCING SHALL BE ERECTED PRIOR TO ANY GRADING OR CONSTRUCTION ACTIVITIES–PREVENTING COMPACTION OF ROOT SYSTEMS OF TREES TO BE PRESERVED. THE FENCING SHALL ENCLOSE THE AREA BENEATH THE DRIP LINE OF THE TREE CANOPY AND SHALL REMAIN IN PLACE UNTIL ALL CONSTRUCTION IS COMPLETE. NO PARKING, MATERIAL STORAGE OR CONSTRUCTION ACTIVITIES SHALL BE PERMITTED WITHIN THE FENCED AREA.
4. A LANDSCAPE AND TREE CANOPY PLAN PER CHAPTER 10 OF THE LDC SHALL BE PROVIDED AS REQUIRED PRIOR TO ISSUANCE OF BUILDING PERMIT.
5. THE DEVELOPMENT LIES IN THE ANCHORAGE MIDDLETOWN FIRE DISTRICT.
6. IF PROPOSED, SIGNATURE ENTRANCE WALLS SHALL BE SUBMITTED TO AND APPROVED BY THE PLANNING STAFF PRIOR TO CONSTRUCTION PLAN APPROVAL AND THEY SHALL MEET THE REQUIREMENTS OF CHAPTER 4.4.3 OF THE LDC.
7. ALL LUMINAIRES SHALL BE AIMED, DIRECTED OR FOCUSED SUCH AS TO NOT CAUSE DIRECT LIGHT FROM THE LUMINAIRE TO BE DIRECTED TOWARDS RESIDENTIAL USES OR PROJECTED OPEN SPACES (IE. CONSERVATION EASEMENTS, GREENWAYS OR PARKWAYS) ON ADJACENT OR NEARBY PARCEL'S, OR TO CREATE GLARE PERCEPTIBLE ON PUBLIC STREETS AND RIGHT–OF–WAYS PER CHAPTER 4.1.3. OF THE LDC.
8. MITIGATION MEASURES FOR DUST CONTROL SHALL BE IN PLACE DURING CONSTRUCTION TO PREVENT FUGITIVE EMISSIONS REACHING EXISTING ROADS AND NEIGHBORHOODS.
9. ALL EXISTING STRUCTURES AND EXISTING ENTRANCES SHALL BE REMOVED, EXCEPT AS NOTED ON THE PLAN.
10. IN ACCORDANCE WITH CHAPTER 4.9 OF THE LDC, A KARST SURVEY WILL BE PERFORMED.

MSD NOTES:

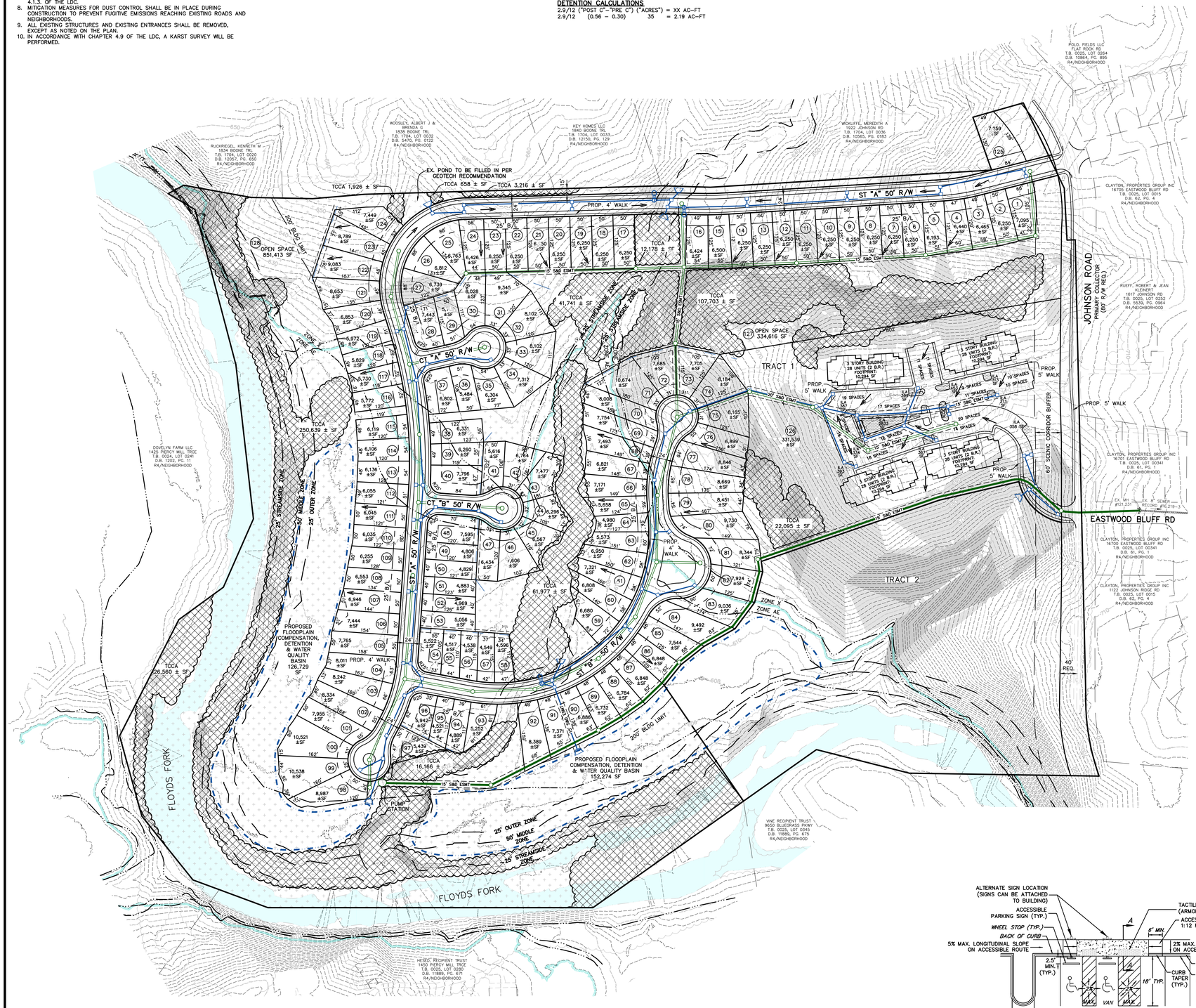
1. CONSTRUCTION PLANS & DOCUMENTS SHALL COMPLY WITH LOUISVILLE AND JEFFERSON COUNTY METROPOLITAN SEWER DISTRICT'S DESIGN MANUAL AND STANDARD SPECIFICATIONS.
2. WASTEWATER:
   SANITARY SEWER WILL CONNECT TO THE FLOYD'S FORK WASTEWATER TREATMENT PLANT BY LATERAL EXTENSION AGREEMENT, SUBJECT TO FEES. SANITARY SEWER CAPACITY TO BE APPROVED BY METROPOLITAN SEWER DISTRICT.
3. DRAINAGE/STORMWATER DETENTION:
   DETENTION TO BE PROVIDED ON SITE AS DEPICTED ON THE PLAN. POST–DEVELOPMENT PEAK FLOWS WILL NOT EXCEED PRE–DEVELOPED PEAK FLOWS FROM DEVELOPMENT FOR THE 2, 10, 25, AND 100 YEAR STORMS OR TO DOWNSTREAM CAPACITY, WHICH IS MORE RESTRICTIVE. DRAINAGE PATTERN (DEPICTED BY FLOW ARROWS) IS FOR THE CONCEPT PURPOSES ONLY. FINAL CONFIGURATION AND SIZE OF DRAINAGE PIPES AND CHANNELS SHALL BE DETERMINED DURING THE CONSTRUCTION PLAN DESIGN PROCESS. DRAINAGE FACILITIES SHALL CONFORM TO MSD REQUIREMENTS.
4. EROSION AND SILT CONTROL:
   A SOIL AND SEDIMENTATION CONTROL PLAN SHALL BE DEVELOPED AND IMPLEMENTED IN ACCORDANCE WITH MSD AND THE USDA NATURAL RESOURCES CONSERVATION SERVICE RECOMMENDATIONS.
5. A PORTION OF THE SUBJECT PROPERTY LIES WITHIN A FLOOD HAZARD AREA PER FEMA'S FIRM MAPPING (21111C0 035E).
6. THE FINAL DESIGN OF THIS PROJECT MUST MEET ALL MS4 WATER QUALITY REGULATIONS ESTABLISHED BY MSD. SITE LAYOUT MAY CHANGE AT DESIGN PHASE DUE TO PROPER SIZING OF GREEN BEST MANAGEMENT PRACTICES.

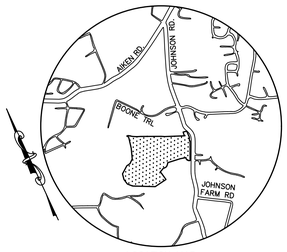
PUBLIC WORKS AND KTC NOTES:

1. NO LANDSCAPING AND COMMERCIAL SIGNS SHALL BE PERMITTED IN STATE AND METRO WORKS RIGHT–OF–WAY.
2. RIGHT–OF–WAY DEDICATION BY DEED OR MINOR PLAT MUST BE RECORDED PRIOR TO SITE CONSTRUCTION APPROVAL BY PUBLIC WORKS OR WITH ASSOCIATED RECORD PLAT AS REQUIRED BY METRO PUBLIC WORKS.
3. COMPATIBLE UTILITY LINES (ELECTRIC, PHONE, CABLE) SHALL BE PLACED IN A COMMON TRENCH UNLESS OTHERWISE REQUIRED BY APPROPRIATE AGENCIES.
4. STREET TREES SHALL BE PLANTED IN A MANNER THAT DOES NOT AFFECT PUBLIC SAFETY AND MAINTAINS PROPER SIGHT DISTANCE. FINAL LOCATION WILL BE DETERMINED DURING CONSTRUCTION APPROVAL PROCESS.
5. AN ENCROACHMENT PERMIT AND BOND MAY BE REQUIRED BY METRO PUBLIC WORKS FOR ROADWAY REPAIRS ON ALL SURROUNDING ACCESS ROADS TO THE SITE DUE TO DAMAGES CAUSED BY CONSTRUCTION TRAFFIC ACTIVITIES.
6. THE DEVELOPER IS RESPONSIBLE FOR ANY UTILITY RELOCATION ON THE PROPERTY.
7. TREES AND SHRUBBERY SHALL BE TRIMMED OR REMOVED TO PROVIDE SIGHT DISTANCE AS REQUIRED PER METRO PUBLIC WORKS STANDARDS.
8. ALL SIDEWALK RAMPS SHALL CONFORM TO A.D.A. STANDARD SPECIFICATION, THE "SPECIAL NOTE FOR DETECTABLE WARNING FOR SIDEWALK RAMPS" PER KTC STANDARD DRAWING FOR SIDEWALKS AND PER "KENTUCKY STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," LATEST EDITION.

DETENTION CALCULATIONS

2.9/12 ("POST C"–"PRE C") ("ACRES") = XX AC–FT
2.9/12 (0.56 – 0.30) 35 = 2.19 AC–FT





LOCATION MAP
NO SCALE

SITE DATA:

FORM DISTRICT	NEIGHBORHOOD
EXISTING ZONING	R4
EXISTING LAND USE	SINGLE FAMILY RESIDENTIAL/AGRICULTURAL
PROPOSED LAND USE	SINGLE & MULTI–FAMILY RESIDENTIAL (MRDI)
GROSS LAND AREA	72.54± AC
TRACT 1	61.09± AC
TRACT 2	11.45± AC (NOT INCLUDED IN PROPOSED DEVELOPMENT)
NET LAND AREA	54.8± AC
TOTAL NUMBER OF UNITS	237 UNITS
SINGLE–FAMILY	125 LOTS
MULTI–FAMILY	112 UNITS
GROSS DENSITY	3.87 D.U./AC
NET DENSITY	4.32 D.U./AC*
TOTAL OPEN SPACE PROVIDED	27.23± AC (44%)
AVERAGE LOT SIZE CALCULATION:	
TOTAL BUILDABLE LOT AREAS/TOTAL BUILDABLE LOTS	
1,193,973± SF/126(INCLUDES MULTI–FAMILY LOT)	9,476± SF

MIXED RESIDENTIAL DEVELOPMENT INCENTIVE (MRDI) POINTS:

% MULTI–FAMILY UNITS:	47%	2 POINTS
% AFFORDABLE UNITS:	12 (5%)	1 POINT
% COMMON OPEN SPACE	44%	3 POINTS
> 15% BELOW POVERTY LEVEL	6.03%	2 POINTS
TOTAL		8 POINTS

*8 POINTS = 5% DENSITY BONUS = 5.08 DU/AC ALLOWED IN R–4

SITE DATA: SINGLE–FAMILY RESIDENTIAL

BUILDABLE LOTS	125
NON–BUILDABLE LOTS	2
DIMENSIONAL STANDARDS:	
MINIMUM LOT SIZE	4,500 SF (9,000 SF AVG)
MINIMUM LOT WIDTH	40'
FRONT YARD & STREET SIDE YARD	15' (25' IF GARAGE FACING STREET)
SIDE YARD	5'
REAR YARD MIN.	25'

SITE DATA: MULTI–FAMILY RESIDENTIAL

NUMBER OF DWELLING UNITS	112
PARKING REQUIRED	
MINIMUM (1 SPACE/D.U.)	112 SPACE
MAXIMUM (2 SPACE/D.U.)	224 SPACES
PARKING PROVIDED	
CAR PARKING	188 SPACES (INCLUDES 6 ADA SPACES)
PARKING AREA RATIO	1.67 SP./UNIT
LANDSCAPE DATA:	
V.U.A.	59,487 SF
I.L.A. REQUIRED	4,461 SF (7.5%)
I.L.A. PROVIDED	6,821 SF

SITE DATA TREE CANOPY:

GROSS SITE AREA	61.09± AC (2,661,157± SF)
PROPOSED LAND USE	SINGLE & MULTI–FAMILY RESIDENTIAL (MRDI)
EXISTING TREE CANOPY	910,757± SF (34%)
*TREE CANOPY TO BE PRESERVED	544,859± SF (21%)
TOTAL TREE CANOPY REQUIRED	1,064,463± SF (40%)
TREE CANOPY TO BE PLANTED	519,604± SF (19%)

TREE CANOPY DEPICTED ON PLAN PER MSD LOJIC MAPPING, AERIAL PHOTO OR FIELD SURVEY. TREE CANOPY CALCULATIONS BASED UPON TREE AREAS SHOWN. *IF DRIPLINE IS PLOTTED/FIELD LOCATED THE AREA OF CANOPY TO BE PLANTED MAY BE REDUCED BY THE EXISTING CANOPY TO BE PRESERVED PER 10.1.5.A.2 OF THE LDC.

LEGEND

- EXISTING CONTOUR
- EXISTING TREE MASS
- EXISTING TREE
- EXISTING FENCE
- EXISTING SANITARY MANHOLE W/PIPE
- PROPOSED TREE MASS
- PROPOSED HANDICAP SPACE
- PROPOSED CATCH BASIN & YARD DRAIN W/PIPE
- PROPOSED STORM MANHOLE W/PIPE
- PROPOSED HEADWALL W/PIPE
- PROPOSED WATER QUALITY UNIT W/PIPE
- PROPOSED DITCH/SWALE
- PROPOSED SANITARY MANHOLE W/PIPE
- PROPOSED FORCEMAIN
- TCCA — PROPOSED TREE CANOPY CREDIT AREA
- PROPOSED DRAINAGE ARROW
- INTERIOR LANDSCAPE AREA (ILA)
- OPEN SPACE AREA
- EXISTING SLOPES 20–30%
- EXISTING SLOPES 30–100%

TYPICAL ACCESSIBLE PARKING SPACES
NO SCALE

GRAPHIC SCALE 1"=100'
0 50 100 200

CASE NUMBER: ––––––––
MSD WM # XXXX

MINDEL SCOTT
ENGINEERING ▶ SURVEYING ▶ PLANNING ▶ LANDSCAPE ARCHITECTURE
312 E. MARKET ST. LOUISVILLE, KY 40202
502-485-1308 ▶ MindelScott.com

HIGHGATES

DEVELOPER
HIGHGATES MANAGEMENT
7301 MONSEY CIRCLE
LOUISVILLE, KY 40219

OWNER
JEAN RUEFF
1617 JOHNSON ROAD
LOUISVILLE, KY 40245

PRELIMINARY SUBDIVISION PLAN
(MIXED RESIDENTIAL DEVELOPMENT INCENTIVE)

JOHNSON ROAD RESIDENTIAL

1614 JOHNSON ROAD
LOUISVILLE, KY 40245
T.B. 0025, LOT 0068
D.B. 6403, PG. 0333

Revisions

Vertical Scale: N/A
Horizontal Scale: 1"=100'
Date: 03/07/22
Job Number: 3622

Sheet
1
of 1

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