December 28, 2018

S. B. Rives
Long Run Creek Properties LLC
3911 Wilderness Trail
Louisville, Kentucky 40299
sevirb926@gmail.com

Subject: Geotechnical Slope Evaluation Report
Proposed Echo Trail Subdivision
2605 Echo Trail, Eastwood Fisherville Road
Louisville, Kentucky 40245
ECS Project No. 61-1893

Dear Mr. Rives:

A new residential subdivision is proposed for construction in Louisville, Jefferson County, Kentucky. The site is located east of Echo Trail, approximately 2/3 mile south of I-64, and approximately 1-mile southeast of the Parklands of Floyds Fork. The approximate site location is shown on the attached Site Vicinity Map. The property generally consisted of wooded, rolling hills with some cleared fields. Surface drainage generally was directed to Long Run along the southern and eastern portions of the site by small swales and streams. Provided drawings and Google Earth data indicated that existing surface elevations ranged from approximately ~EL 560 to ~EL 580 at low points along the northeastern and southern portions of the site, to ~EL 680 in the western portion of the site.

The "Preliminary Subdivision (Development Potential Transfer) & Floyds Fork Overlay Plan, Echo Trail" (Plan) prepared by Mindel Scott, dated 10/15/2018 identified existing 20-30% slopes and >30% slopes on the property. A reduced copy of this drawing is attached.

The current Metro Louisville Land Development Code (LDC) 4.7.5 includes requirements for land disturbing activities on slopes greater than 20%. Item B.3 of 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

USGS Geologic Quadrangle Map Review

The "Geologic Map of the Fisherville Quadrangle, Jefferson County, Kentucky" published by the U. S. Geological Survey and shown on the Kentucky Geologic Map Information Service indicated that the majority of the proposed development area (roughly above ~EL 620) was underlain by the Drakes Formation. The lower slopes were underlain by Grant Lake Limestone (roughly ~EL 580 to ~EL 620), with the remainder of the site mantled by alluvium (roughly below ~EL 580). The mapped extent of the bedrock formations is shown on Figure 1.

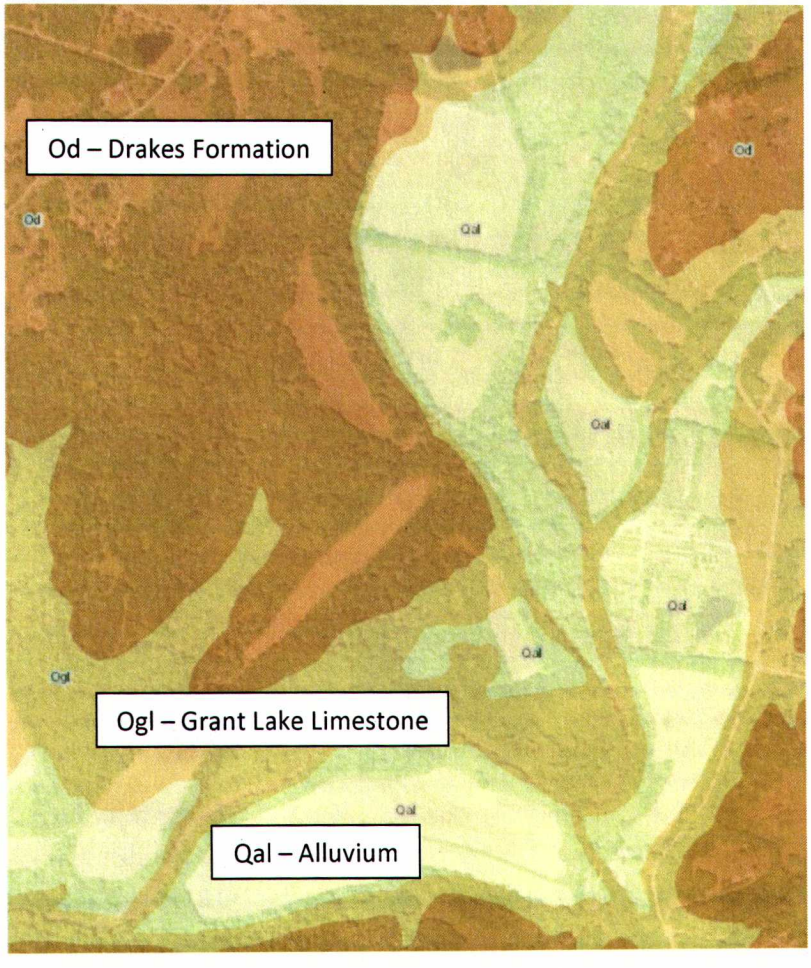

Figure 1: Reported Site Geology

Drakes Formation (4 Members: Hitz Limestone Bed, Saluda Dolomite Member, Bardstown Member, Rowland Member)

Total Reported Thickness: ±140'
Karst Potential: Low

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Hitz Limestone Bed of Saluda Dolomite Member
Primary Lithology: Limestone, dolomite, and shale.
Total Reported Thickness: 0' – 7'

Limestone and dolomite are dark gray to olive gray, weather light gray to grayish orange, locally reddish brown cast; very fine to medium grained, silty, laminated in part; hackly to blocky fracture; inter-bedded and inter-tongued. Limestone and dolomite occur in at least four distinct alternating layers 0.2 to 0.4 foot thick with limestone at base. Pink calcite locally fills large fossil cavities. Shale is grayish black to dusky brown, carbonaceous, calcareous, and strongly fissile; commonly in two beds, one about 0.5 foot thick near base and one 0.2 foot thick near top. Small sinkholes are common.

Saluda Dolomite Member
Primary Lithology: Dolomite and dolomudstone.
Total Reported Thickness: 37 – 45'

Dolomite, greenish gray, light to medium light gray, grayish yellowish green, and light olive gray in distinct color bands, weathers same to grayish orange and yellowish gray; mottled in part. Dolomite in upper three fourths of unit is laminated; calcareous; quartz silt and sand grains make up 0 to 3 percent; mud cracks and rip up clasts on some bedding planes; weathers blocky to massive in steep ravines, shaly to flaggy on weathered slopes. Lower one-fourth of unit is dolomudstone that lacks prominent lamination; fracture is subconchoidal; weathers shaly or to blocky prisms 1 to 2 inches across. Limestone is bluish gray, weathers olive gray to brownish gray; dense, micritic; conchoidal fracture; commonly as one or two beds 0.1 to 0.6 foot thick in lower part of laminated dolomite sequence. Shale, in same part of sequence, light gray to olive black, 0.1 to 1.0 foot thick. Basal 5 feet of unit locally contains very thin inter-beds of abundantly fossiliferous limestone characteristic of underlying Bardstown Member. Residuum thickest 3 to 7 feet on ridgetops. Water sufficient only for domestic and farm use is obtained from shallow wells in the Saluda Dolomite.

Bardstown Member
Primary Lithology: Limestone, mudstone, and shale.
Total Reported Thickness: 35 – 46'

Limestone, mudstone, and shale. Limestone in three types: Most common type is medium to dark gray, weathers yellowish brown; micritic to fine grained; beds very thin, laminated, continuous; fossils common. Second type is medium light gray to light olive gray, weathers light gray to dark yellowish orange; micritic to coarse grained; beds very thin, discontinuous; abundant whole fossils distinctive. Third type is muddy limestone, bluish to olive gray, weathers greenish gray to yellowish green, resembles limestone of underlying Rowland Member. Mudstone and shale, as inter-beds in limestone, are olive gray, somewhat calcareous, weather light olive gray to light gray. Near top and base shale is calcareous and carbonaceous, grayish to brownish black, weathers medium gray, in beds 0.1 foot to nearly 1-foot thick. All shale is fossiliferous.

Rowland Member
Primary Lithology: Limestone and shale.
Total Reported Thickness: ±50'

Limestone and shale. Dominant limestone is medium gray 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

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glauconitic material which weathers readily to form a pitted surface; thin to thick bedded in continuous planar beds; internal bedding laminations poorly preserved owing to bioturbation. Thin inter-beds of brownish black carbonaceous shale in this zone are similar to shale beds near base of overlying Bardstown Member. Dominant shale is olive gray, light olive gray, dark greenish gray, and greenish gray; weathers yellowish gray; calcareous, clayey; inter-beds higher in section are thinner and less prominent except near top of member where shale is locally dominant rock type in upper 5 feet. Basal shale contains locally cherty, laminated, thin bedded limestone in southern and central parts of quadrangle, and, in north central part along Floyds Fork between U.S. Highway 60 and Interstate Highway 64, a cross-bedded, fossil fragmental, mud supported limestone. Water sufficient only for domestic and farm use is obtained from shallow wells in the Rowland Members. Springs issue locally from limestone beds immediately above thick shale sections in the Rowland. Small sinkholes are common.

Grant Lake Limestone

Total Reported Thickness: ±100'
Karst Potential: Medium
Primary Lithology: Limestone and shale.

Limestone and shale. Dominant limestone type is medium gray, contains abundant coarse fossil fragments and whole fossils in a greenish gray calcareous mudstone or a medium to very coarse grained calcarenite cemented by sparry calcite; beds uneven to nodular, some continuous, commonly less than 0.2 foot thick; the brachiopod Platystrophia ponderosa is abundant. Less abundant limestone type is medium gray, fossil fragmental, poorly sorted calcarenite with sparry cement; weathers with abundant brown specks; in crossbeds 0.1 to 1.3 feet thick with smooth to undulating surfaces. Cross-bedded limestone common about 10 feet below top of unit; forms 15 foot thick sequence underlying bench capped with alluvial gravel along east side of Floyds Fork between the mouths of Pope Lick and Cane Run 45 to 60 feet below top of unit. Least abundant limestone type is medium gray, micro-grained to medium grained, well-sorted, planar laminated calcarenite to calcisiltite in smooth surfaced, even, continuous inter-beds 0.1 to 0.4 foot thick; fossils not conspicuous; this limestone type present only in upper part of unit. Shale is olive gray to dark greenish gray, weathers light olive gray and dusky yellow; calcareous; in partings and beds 0.1 to 1.2 feet thick, commonly less than 0.6 foot thick; sparsely fossiliferous. Base of unit not exposed. Water sufficient only for domestic and farm use is obtained from shallow wells from the thick calcarenite in the upper part of the Grant Lake Limestone. Springs issue from thick calcarenite in the Grant Lake Limestone. Small ponds for livestock and for recreation are common in areas surfaced by the shale of the upper part of the Grant Lake Limestone.

Alluvium

Total Reported Thickness: 0-30'
Karst Potential: Non-karst
Primary Lithology: Silt, clay, sand, and gravel.

Silt, clay, sand, and gravel; along Floyds Fork, silty clay, olive gray in root zone, grades downward to moderate brown to grayish brown clayey silt with blocky structure, then to moderate brown, calcareous, sandy, silty clay containing thin-shelled pelecypods, in turn underlain by as much as 3.5 feet of limestone gravel containing abundant cobbles and pebbles. In smaller stream valleys alluvium is brown to dark grayish brown silty clay and clayey silt, sand, and gravel.

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Gravel ranges in size from granules to boulders. Most granules and sand are limonite derived from soil; pebbles, cobbles, and slabs are from local bedrock. Older alluvium on limestone bench 30 to 45 feet above Floyds Fork is 15 to 20 feet thick; alluvium beneath modern flood plain is 8 to 10 feet thick. Basal gravel in older alluvium contains pebbles as much as 0.2 foot long; consists of brown chert, quartz geodes, silicified corals, and limonite cemented siltstone; overlain by grayish orange to moderate yellowish orange silty clay. Locally completely removed by stream erosion. Older alluvial soils include mainly Elk, Captina, Robertsville, and Taft Series; younger alluvial soils include Huntington, Ashton, Newark, and Lindside Series. Water sufficient only for domestic and farm use is obtained from shallow wells in alluvium

Soil Conservation Service Soil Survey

The USDA Natural Resources Conservation Service "Web Soil Survey" website indicated 22 general soil types at the site as shown in Figure 2. Descriptions of these soil types are summarized below.

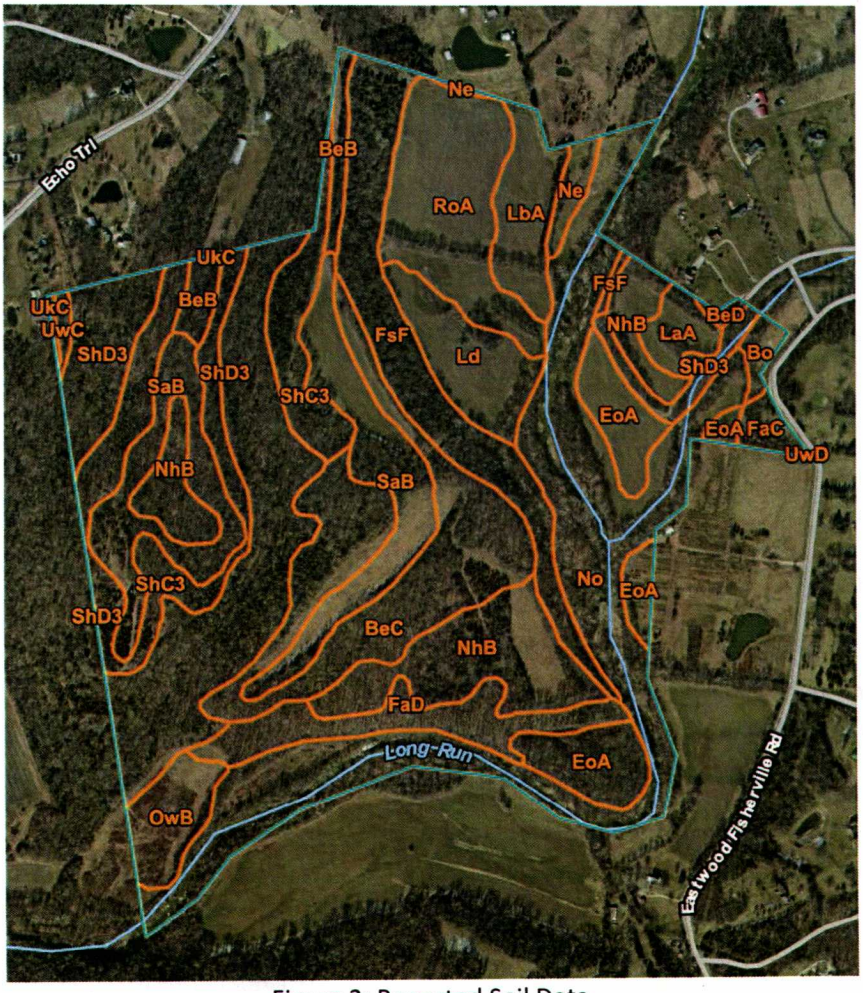

Figure 2: Reported Soil Data

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BeB Beasley silt loam – 2 to 6 percent slopes
Parent material – clayey residuum weathered from calcareous shale
Typical Profile
0 to 7 inches: silt loam
7 to 29 inches: silty clay
29 to 50 inches silty clay
50 to 60 inches: bedrock

BeC Beasley silt loam – 6 to 12 percent slopes
Parent material – clayey residuum weathered from calcareous shale and/or calcareous siltstone
Typical Profile
0 to 6 inches: silt loam
6 to 48 inches: silty clay
48 to 58 inches: weathered bedrock

BeD Beasley silt loam – 12 to 25 percent slopes
Parent material – clayey residuum weathered from calcareous shale and/or calcareous siltstone
Typical Profile
0 to 6 inches: silt loam
6 to 48 inches: silty clay
48 to 58 inches: weathered bedrock

Bo Boonewood silt loam – occasionally flooded
Parent material – mixed fine-silty alluvium over limestone
Typical Profile
0 to 6 inches: silt loam
6 to 30 inches: silty clay
30 to 40 inches: unweathered bedrock

EoA Elk silt loam – 0 to 2 percent slopes, occasionally flooded
Parent material – mixed fine-silty alluvium
Typical Profile
0 to 36 inches: silt loam
36 to 69 inches: silty clay loam
69 to 87 inches: gravely silty clay loam

FaC Faywood silt loam – 6 to 12 percent slopes
Parent material – clayey residuum weathered from limestone and shale
Typical Profile
0 to 7 inches: silt loam
7 to 29 inches: silty clay
29 to 39 inches: bedrock

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FaD Faywood silt loam – 12 to 25 percent slopes
Parent material – clayey residuum weathered from limestone and shale
Typical Profile
0 to 7 inches: silt loam
7 to 29 inches: silty clay
29 to 39 inches: bedrock

FsF Faywood-Shrouts-Beasley complex – 25 to 50 percent slopes
Parent material – clayey residuum weathered from limestone and shale
Typical Profile
0 to 7 inches: silt loam
7 to 29 inches: silty clay
29 to 39 inches: unweathered bedrock

LaA Lawrence silt loam – 0 to 2 percent slopes
Parent material – fine-silty alluvium over clayey residuum weathered from limestone and dolomite
Typical Profile
0 to 38 inches: silt loam
38 to 53 inches: silty clay loam
53 to 80 inches: silty clay

LbA Lawrence silt loam – 0 to 2 percent slopes, occasionally flooded
Parent material – fine-silty alluvium over clayey residuum weathered from limestone and dolomite
Typical Profile
0 to 44 inches: silt loam
44 to 80 inches: silty clay

Ld Lindside silt loam – 0 to 2 percent slopes, occasionally flooded
Parent material – mixed fine-silty alluvium
Typical Profile
0 to 27 inches: silt loam
27 to 80 inches: silty clay loam

Ne Newark silt loam – 0 to 2 percent slopes, occasionally flooded
Parent material – mixed fine-silty alluvium
Typical Profile
0 to 7 inches: silt loam
7 to 66 inches: silty clay loam
66 to 80 inches: loam

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NhB Nicholson silt loam – 2 to 6 percent slopes
Parent material – fine-silty noncalcareous loess over clayey residuum weathered from limestone
Typical Profile
0 to 28 inches: silt loam
28 to 38 inches: silty clay loam
38 to 80 inches: clay

No Nolin silt loam – 0 to 2 percent slopes, occasionally flooded
Parent material – mixed fine-silty alluvium
Typical Profile
0 to 82 inches: silt loam
82 to 101 inches: loam

OwB Otwood silt loam – 2 to 6 percent slopes, occasionally flooded
Parent material – mixed fine-silty alluvium
Typical Profile
0 to 83 inches: silt loam
83 to 91 inches: loam

RoA Robertsville silt loam – 0 to 2 percent slopes
Parent material – thin fine-silty loess over clayey residuum weathered from limestone
Typical Profile
0 to 7 inches: silt loam
7 to 66 inches: silty clay loam
66 to 80 inches: loam

SaB Sandview silt loam – 2 to 6 percent slopes
Parent material – thin fine-silty loess over clayey residuum weathered from limestone and dolomite
Typical Profile
0 to 41 inches: silt loam
41 to 82 inches: silty clay

ShC3 Shrouts silt loam – 6 to 12 percent slopes – severely eroded
Parent material – clayey residuum weathered from calcareous shale and/or siltstone
Typical Profile
0 to 2 inches: silt loam
2 to 35 inches: silty clay
35 to 45 inches: weathered bedrock

ShD3 Shrouts silt loam – 12 to 25 percent slopes – severely eroded - very rocky
Parent material – clayey residuum weathered from calcareous shale and/or siltstone
Typical Profile
0 to 2 inches: silt loam
2 to 35 inches: silty clay
35 to 45 inches: weathered bedrock

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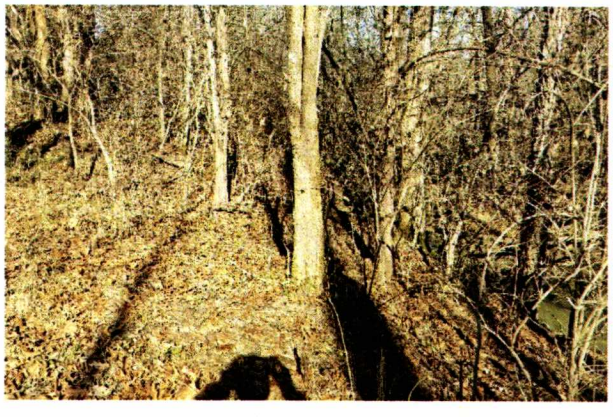
UkC Urban land – Alfic Udarents - Beasley complex - 0 to 12 percent slopes
Parent material – clayey residuum weathered from calcareous shale and/or calcareous siltstone
Typical Profile
0 to 48 inches: silty clay
48 to 58 inches weathered bedrock

UwC Urban land – Alfic Udarents - Shrouts complex - 0 to 12 percent slopes
Parent material – clayey residuum weathered from calcareous shale and/or calcareous siltstone
Typical Profile
0 to 35 inches: silty clay
35 to 45 inches weathered bedrock

UwD Urban land – Alfic Udarents - Shrouts complex - 12 to 25 percent slopes
Parent material – clayey residuum weathered from calcareous shale and/or calcareous siltstone
Typical Profile
0 to 35 inches: silty clay
35 to 45 inches weathered bedrock

Visual Reconnaissance of Selected Slope Areas

Three areas shown on the Plan as >30% slopes would be disturbed during site development for new road construction (Area 01 and 02) and new home construction (Area 03 / Lot 29). See attached Visual Slope Reconnaissance Plan for approximate locations. A visual reconnaissance of these areas was conducted on December 19, 2018. Photos of the conditions observed at these areas are shown below. Similar conditions were observed in most areas. The slopes primarily were wooded with many small to large trees. Brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. Flag stones were observed along the bottom and banks of swales and small streams. Some indications of erosion were observed including occasional patches of bare soil and small gullies, primarily along the swales and small streams. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.



Steep slope at Area 01

Steep slope at Area 02

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Steep Slope Area 03


Steep Slope Area 03

Based on our review of the above reference information and on our past experience with construction under similar conditions in Jefferson County, our opinion is that the on-site slopes (excluding small, localized erosion features along swales and streams) in the observed areas were stable at the time of our reconnaissance. The current, on-site slope stability likely is related to the following factors:

- Relatively thin depths of soil in slope areas
- Cohesive (clayey) soil matrix
- Rocky soil texture
- Limestone bedrock in many areas
- 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 the evaluated on-site slopes, provided that the planned subdivision configuration does not involve disturbance significantly greater that what was indicated on the Plan.

Several measures may be considered to help maintain the stability of the existing and planned slopes during construction of the new subdivision and over the life of the new homes. These measures 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 or at the toe of existing slopes.
- Avoid significant embankments along or at 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 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.

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- 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.

We appreciate the opportunity to work with you on this project. If you have any questions about this evaluation, or if you need any further assistance, please call us at any time.

Cordially,
ECS Southeast, LLP

Jeremy Hudson, P.E.
Senior Project Engineer

STATE OF KENTUCKY
JEREMY HUDSON
27864
LICENSED PROFESSIONAL ENGINEER

Michael C. Ronayne, P.E.
Chief Engineer

Attachments: Site Vicinity Map
Preliminary Plan South English Station Property
Visual Slope Reconnaissance Plan

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PLANNING & DESIGN SERVICES

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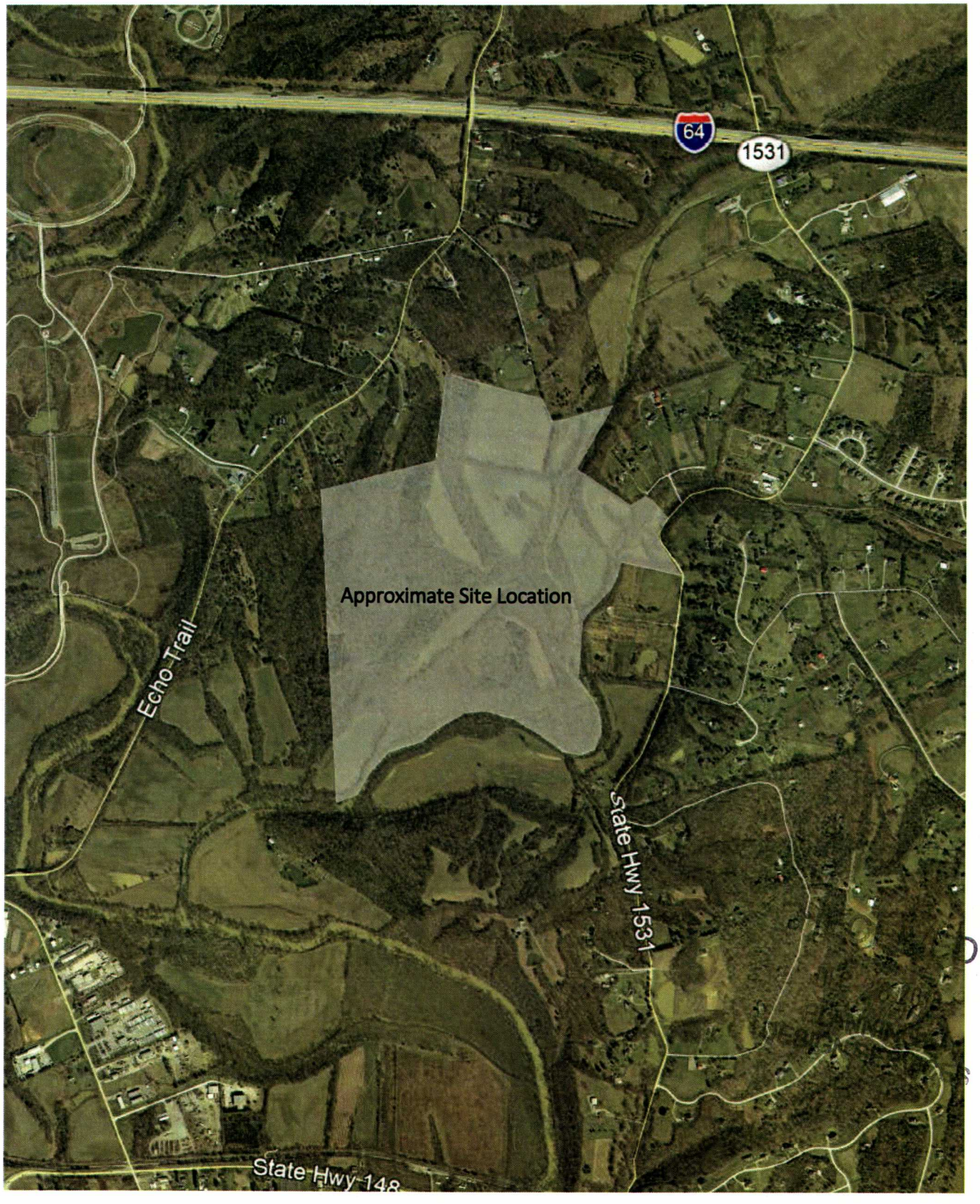

Site Vicinity Map
Proposed Echo Trail Subdivision
2605 Echo Trail
Louisville, Kentucky 40245
ECS Project No. 61-1893

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Louisville, Kentucky 40299
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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. ALL ROADWAY AND ENTRANCE INTERSECTIONS SHALL MEET THE REQUIREMENTS FOR LANDING AREAS AS SET BY METRO PUBLIC WORKS.
4. VERGE AREA WITH PUBLIC RIGHT-OF-WAY TO BE PROVIDED PER METRO PUBLIC WORKS.
5. COMPATIBLE UTILITY LINES (ELECTRIC, PHONE, CABLE) SHALL BE PLACED IN A COMMON TRENCH UNLESS OTHERWISE REQUIRED BY APPROPRIATE AGENCIES.
6. STREET TREES SHALL BE PLANTED IN A MANNER THAT DOES NOT AFFECT PUBLIC SAFETY AND MAINTAINS PROPER SITE DISTANCE. FINAL LOCATION WILL BE DETERMINED DURING CONSTRUCTION APPROVAL PROCESS.
7. 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.
8. ALL STREET NAME SIGNS AND PAVEMENT MARKINGS SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) REQUIREMENTS AND BE INSTALLED PRIOR TO CONSTRUCTION OF THE FIRST RESIDENCE OR BUILDING ON THE STREET AND SHALL BE IN PLACE PRIOR TO REQUESTING A CERTIFICATE OF OCCUPANCY.
9. THE MINIMUM GRADE OF ALL STREETS SHALL BE ONE (1%) PERCENT AND A MAXIMUM GRADE OF TEN (10%) PERCENT WITHOUT APPROVAL FROM THE DIRECTOR OF PUBLIC WORKS.
10. THE DEVELOPER IS RESPONSIBLE FOR ANY UTILITY RELOCATION ON THE PROPERTY.
11. ALL CUL-DE-SACS AND ROADWAY PAVEMENT WIDTHS, RADII, SIDEWALK LOCATIONS AND OFFSETS SHALL BE IN ACCORDANCE WITH METRO PUBLIC WORKS STANDARDS AND APPROVED AT THE TIME OF CONSTRUCTION.
12. CURBS AND GUTTER SHALL BE PROVIDED ALONG ALL STREETS IN THE DEVELOPMENT. SIDEWALKS SHALL BE PROVIDED ALONG ALL STREETS WHERE REQUIRED BY THE DEVELOPMENT CODE.
13. TREES AND SHRUBBERY SHALL BE TRIMMED OR REMOVED TO PROVIDE SITE DISTANCE AS REQUIRED PER METRO PUBLIC WORKS STANDARDS.
14. 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.
15. THE APPLICANT SHALL INSTALL SIGNS, APPROVED BY THE METRO PUBLIC WORKS DEPT., WHICH INDICATE THE FUTURE EXTENSION OF THE PUBLIC RIGHT-OF-WAY FOR STREETS "D", "H", & "THE EXTENSION OF SHAKES RUN ROAD" SUCH SIGNS SHALL BE INSTALLED PRIOR TO RELEASE OF BONDS FOR THE INSTALLATION OF THE STREET INFRASTRUCTURE.
16. NO INCREASE OF RUNOFF ALLOWED TO DISCHARGE INTO STATE RIGHT-OF-WAY.

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 FLOYDS 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 (21111C0068E & 21111C0067E).
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. ACOE AND KDOW APPROVAL REQUIRED PRIOR TO MSD CONSTRUCTION PLAN APPROVAL.
8. ANY REQUIRED FILL IN THE FLOODPLAIN SHALL BE COMPENSATED ON SITE AT A RATIO OF 1:1.

DETENTION CALCULATIONS

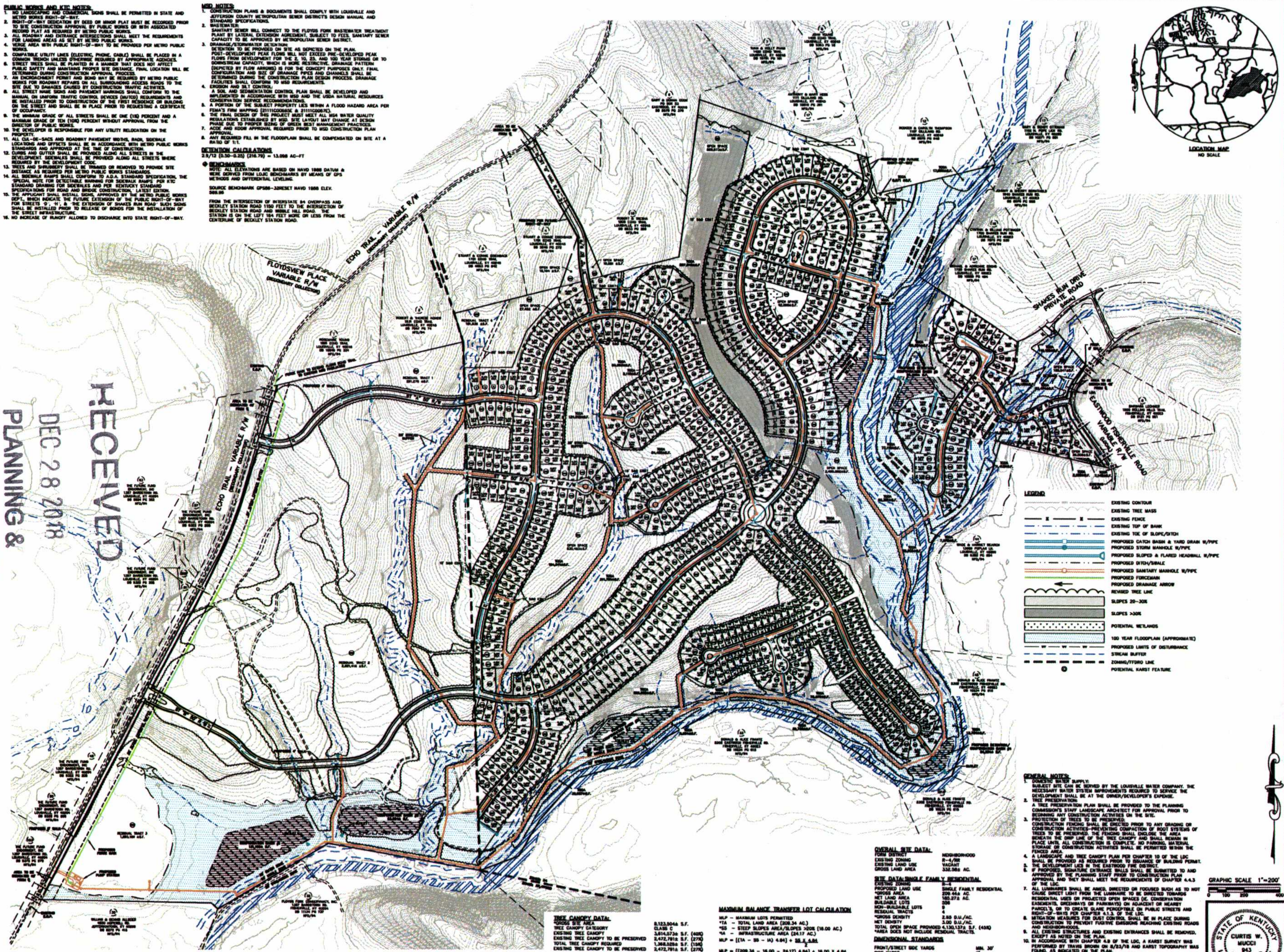
2.9/12 (0.50–0.25) (216.79) = 13.098 AC–FT

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 GPS88-32RESET NAVD 1988 ELEV. 589.96

FROM THE INTERSECTION OF INTERSTATE 64 OVERPASS AND BECKLEY STATION ROAD 1150 FEET TO THE INTERSECTION OF BECKLEY STATION ROAD AND WIBBLE HILL ROAD. THE STATION IS ON THE LEFT 184 FEET MORE OR LESS FROM THE CENTERLINE OF BECKLEY STATION ROAD.



LEGEND

- EXISTING CONTOUR
- EXISTING TREE MASS
- EXISTING FENCE
- EXISTING TOP OF BANK
- EXISTING TOE OF SLOPE/DITCH
- PROPOSED CATCH BASIN & YARD DRAIN W/PIPE
- PROPOSED STORM MANHOLE W/PIPE
- PROPOSED SLOPED & FLARED HEADWALL W/PIPE
- PROPOSED DITCH/SWALE
- PROPOSED SANITARY MANHOLE W/PIPE
- PROPOSED FORCEMAIN
- PROPOSED DRAINAGE ARROW
- REVISED TREE LINE
- SLOPES 20–30%
- SLOPES >30%
- POTENTIAL WETLANDS
- 100 YEAR FLOODPLAIN (APPROXIMATE)
- PROPOSED LIMITS OF DISTURBANCE
- STREAM BUFFER
- ZONING/FFDRO LINE
- POTENTIAL KARST FEATURE

TREE CANOPY DATA:

*GROSS SITE AREA	9,123,504± S.F.
TREE CANOPY CATEGORY	CLASS C
EXISTING TREE CANOPY	3,614,573± S.F. (40%)
EXISTING TREE CANOPY TO BE PRESERVED	2,472,791± S.F. (27%)
TOTAL TREE CANOPY REQUIRED	1,368,528± S.F. (15%)
EXISTING TREE CANOPY TO BE PRESERVED	2,472,791± S.F. (27%)

*AREA DOES NOT INCLUDE RESIDUAL TRACTS.

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

MAXIMUM BALANCE TRANSFER LOT CALCULATION

MLP – MAXIMUM LOTS PERMITTED
*TA – TOTAL LAND AREA (209.34 AC.)
*SS – STEEP SLOPES AREA/SLOPES >20% (16.00 AC.)
*IA – INFRASTRUCTURE AREA (24.17 AC.)

$$MLP = [(TA - SS - IA)\ 4.84] + \frac{SS \times 4.84}{2}$$

$$MLP = [(209.34 - 16.00 - 24.17)\ 4.84] + \frac{16.00 \times 4.84}{2}$$

MLP = 857

*AREA DOES NOT INCLUDE RESIDUAL TRACTS

NOTE: ONLY THE AREAS OF STEEP SLOPES WITHIN OPEN SPACE LOTS ARE USED FOR THE BALANCE TRANSFER AREA CALCULATION.

OVERALL SITE DATA:

FORM DISTRICT	NEIGHBORHOOD
EXISTING ZONING	R-4/RR
EXISTING LAND USE	VACANT
GROSS LAND AREA	332.58± AC.

SITE DATA:SINGLE FAMILY RESIDENTIAL

EXISTING ZONING	R-4
PROPOSED LAND USE	SINGLE FAMILY RESIDENTIAL
*GROSS AREA	209.44± AC.
NET LAND AREA	185.27± AC.
BUILDABLE LOTS	556
NON-BUILDABLE LOTS	9
RESIDUAL TRACTS	4
*GROSS DENSITY	2.65 D.U./AC.
NET DENSITY	3.00 D.U./AC.
TOTAL OPEN SPACE PROVIDED	4,130,137± S.F. (45%)

*AREA DOES NOT INCLUDE RESIDUAL TRACTS.

DIMENSIONAL STANDARDS

FRONT/STREET SIDE YARDS	MIN. 30'
SIDE YARDS	5'
REAR YARD	25'
MAXIMUM BUILDING HEIGHT	35'
DETACHED MINIMUM LOT AREA	4,500 S.F.
LOTS <8,000 S.F. (MAX 25% OR 139 LOTS)	108 LOTS PROPOSED
LOTS ≥8,000 S.F. (MIN 20% OR 111 LOTS)	128 LOTS PROPOSED

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 EASTWOOD 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 TRAVIS BROWN ON 8/23/18 AND KARST TOPOGRAPHY WAS FOUND, AS INDICATED ON THE PLAN.
11. A 50' RIPARIAN VEGETATION STRIP IS REQUIRED BY THE FLOYDS FORK OVERLAY FROM THE ORDINARY HIGH WATER MARK OF LONG RUN CREEK.

PROJECT #18SUBDIV1023
MSD WM # 9674

GRAPHIC SCALE 1"=200'
0 100 200 400

STATE OF KENTUCKY
CURTIS W. MUCCI
943
REGISTERED LANDSCAPE ARCHITECT
PROFESSIONAL'S SEAL

MINDEL SCOTT
ENGINEERING ▸ SURVEYING ▸ PLANNING ▸ LANDSCAPE ARCHITECTURE
5151 Jefferson Blvd. Louisville, KY 40219
502-485-1508 ▸ MindelScott.com

OWNER/DEVELOPER
LONG RUN CREEK PROPERTIES, LLC
3911 WILDERNESS TRAIL
LOUISVILLE, KY 40299

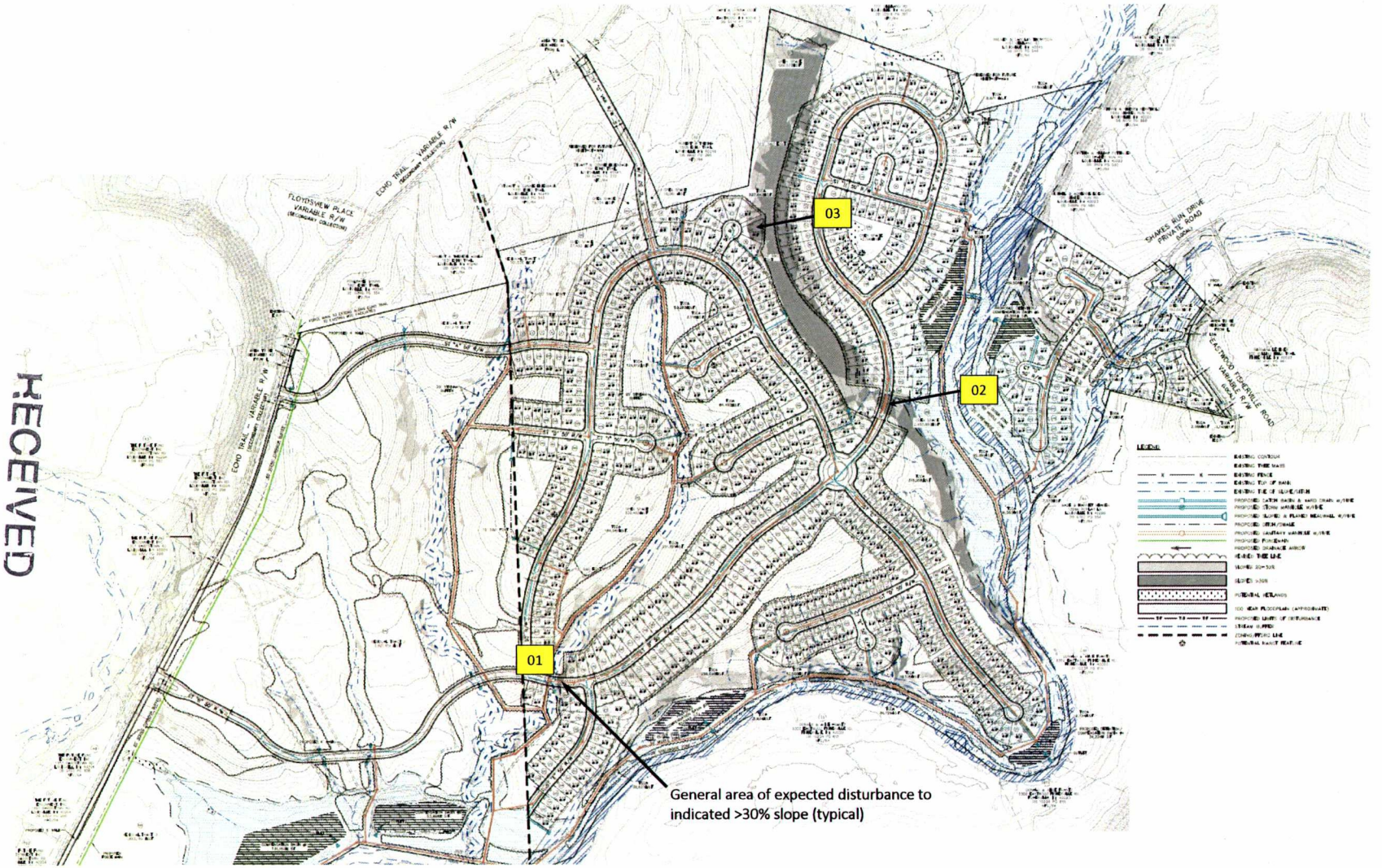
PRELIMINARY SUBDIVISION (DEVELOPMENT POTENTIAL TRANSFER) & FLOYDS FORK OVERLAY PLAN

ECHO TRAIL

2605 ECHO TRAIL, EASTWOOD FISHERVILLE ROAD
LOUISVILLE, KY 40245
TB 41 LOT 199, 18, 212 / TB 42 LOT 46 / TB 2328 LOT 18
DB 11202 PG 487 / DB 9215 PG 196 / DB 10827 PG 62

Revisions
11/02/18 REVISIONS PER AGENCY COMMENTS
11/20/18 REVISIONS PER AGENCY COMMENTS

Vertical Scale: N/A
Horizontal Scale: 1"=200'
Date: 10/15/18
Job Number: 3334
Sheet 1 of 1



Based on "Preliminary Subdivision (Development Potential Transfer) & Floyds Fork Overlay Plan, Echo Trail" prepared by Mindel Scott dated 10/15/2018

Visual Slope Reconnaissance Plan
Proposed Echo Trail Subdivision
2605 Echo Trail
Louisville, Kentucky 40245
ECS Project No. 61-1893

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

January 22, 2018

S. B. Rives
Long Run Creek Properties LLC
3911 Wilderness Trail
Louisville, Kentucky 40299
sevirb926@gmail.com

Subject: Geotechnical Slope Evaluation Report – Addendum 1
Proposed Echo Trail Subdivision
2605 Echo Trail, Eastwood Fisherville Road
Louisville, Kentucky 40245
ECS Project No. 61-1893

Dear Mr. Rives:

ECS Southeast, LLP (ECS) conducted an additional visual reconnaissance of six (6) areas of interest identified by Joel Dock at the proposed Echo Trail Subdivision. A visual reconnaissance of these areas was conducted on January 16, 2019. Photos of the conditions observed at these areas are shown below. The six additional areas are identified as areas 4 through 9 (areas 1 through 3 were addressed in our previous report dated 12/28/18) on the attached Visual Slope Reconnaissance Plan and included the following lots:

- Area 4: Lot 341 (20 – 30% slopes)
- Area 5: Lots 310 – 312 (20 – 30% slopes)
- Area 6: Lots 221 – 223 (20 – 30% slopes)
- Area 7: Lot 452 (20 – 30% slopes)
- Area 8: Lots 53 – 58 (> 30% slopes)
- Area 9: Lots 68 – 82 (> 30% slopes)

Visual Reconnaissance of Selected Slope Areas

Area 4: Lot 341

The slopes primarily were wooded with many small to large trees. Brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. Flag stones were observed along the bottom and banks of the small stream. Some indications of erosion were observed including occasional patches of bare soil and small gullies primarily along the small stream. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.


Typical slope at Area 04


Typical slope at Area 04

Area 5: Lots 310 – 312

The slopes primarily were wooded with many small to large trees. Brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.


Typical slope at Area 05


Typical slope at Area 05

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Area 6: Lots 221 – 223

The slopes primarily were wooded with many small to large trees. Brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.

Typical slope at Area 06

Typical slope at Area 06

Typical slope at Area 07

Typical slope at Area 07

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Area 7: Lot 452

The slopes primarily were wooded with many small to large trees. Dense brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.

Area 8: Lots 53 – 58

The slopes primarily were wooded with many small to large trees. Brush, vines, and other low vegetation also was present. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. Weathered rock appeared to be exposed along the access road located within the eastern half of Lot 54. Significant erosion was observed along the access road including erosion rills and gullies and several areas of exposed soil and weathered rock. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.

Typical slope at Area 08

Access road and erosion at Lot 54

Area 9: Lots 68 – 82

The slopes primarily were wooded with many small to large trees. Very dense brush, vines, and other low vegetation also was present across most of the area with only isolated areas where most of the ground surface was visible. No rock outcrops were observed along hillsides with the exception of occasional, small, isolated cobbles and boulders. Some indications of erosion were observed including occasional patches of bare soil and small gullies along the hillsides. No indications of large, wide-scale scale erosion were noted. No visual indications of slope instability (unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas) were observed over the majority of Area 9. However, a mound of soil was observed in the mid-slope area in Lot 68. In addition, a bent tree was observed in the area of the soil mound. Each are indicators of past slope instability. The soil mound was observed to be approximately 35 to 40 feet in length and less than 2 feet in height, traversing the lot primarily in the north-south direction.

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Typical slope at Area 09 (south)


Typical slope at Area 09 (central)


Typical slope at Area 09 (north)


Bent tree and soil mound along the slope at Lot 68

Conclusions

The erosion observed on the eastern half of Lot 54 appeared to be the result of the use of the area as an access road for farming operations and was likely the result of large equipment disturbing the surface and the lack of ground cover in the area. Restoration in the area of the access road can be achieved by: removing equipment traffic from the area, re-grading the area to remove deep erosion rills, and establishing a vegetative cover for erosion protection.

The observed indications of past slope instability on the western portion of Lot 68 appeared to be the result of slope movement that occurred several years prior to this site visit based the tilt and bow of a tree in the area of the mounded soil, the lack of any obvious tension cracks or scarps along the slope surface, and the presence of dense brush and other vegetation on the surface. The presence of very dense vegetation across most of Area 9 prevented a through observation

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of the slopes. While additional evidence of slope instability was not observed, it is possible that the dense ground cover obscured the presence of slope instability. Once areas where site disturbance for grading and/or utility installation have been cleared of dense vegetation, ECS should be retained to further evaluate those slopes. Significant disturbance of the steeper slopes along the western portions of Lots 68 – 82 should be avoided if possible. If large excavations or significant re-grading in those areas are to occur, ECS should be contacted for guidance.

Based on our review of the available reference information and on our past experience with construction under similar conditions in Jefferson County, our opinion is that the on-site slopes (excluding small, localized erosion features along swales and streams) in the observed areas (excluding Lot 68 mentioned above) were stable at the time of our reconnaissance.

The current, on-site slope stability likely is related to the following factors:

- Relatively thin depths of soil in slope areas
- Cohesive (clayey) soil matrix
- Rocky soil texture
- Limestone bedrock in many areas
- 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 the evaluated on-site slopes, provided that the planned subdivision configuration does not involve disturbance significantly greater that what was indicated on the Plan.

Several measures may be considered to help maintain the stability of the existing and planned slopes during construction of the new subdivision and over the life of the new homes. These measures 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 or at the toe of existing slopes.
- Avoid significant embankments along or at 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 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.
- 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.

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We appreciate the opportunity to work with you on this project. If you have any questions about this evaluation, or if you need any further assistance, please call us at any time.

Cordially,
ECS Southeast, LLP

STATE OF KENTUCKY
JEREMY HUDSON
27664
LICENSED
PROFESSIONAL ENGINEER

Jeremy Hudson, P.E.
Senior Project Engineer

Michael C. Ronayne, P.E.
Chief Engineer

Attachments: Visual Slope Reconnaissance Plan

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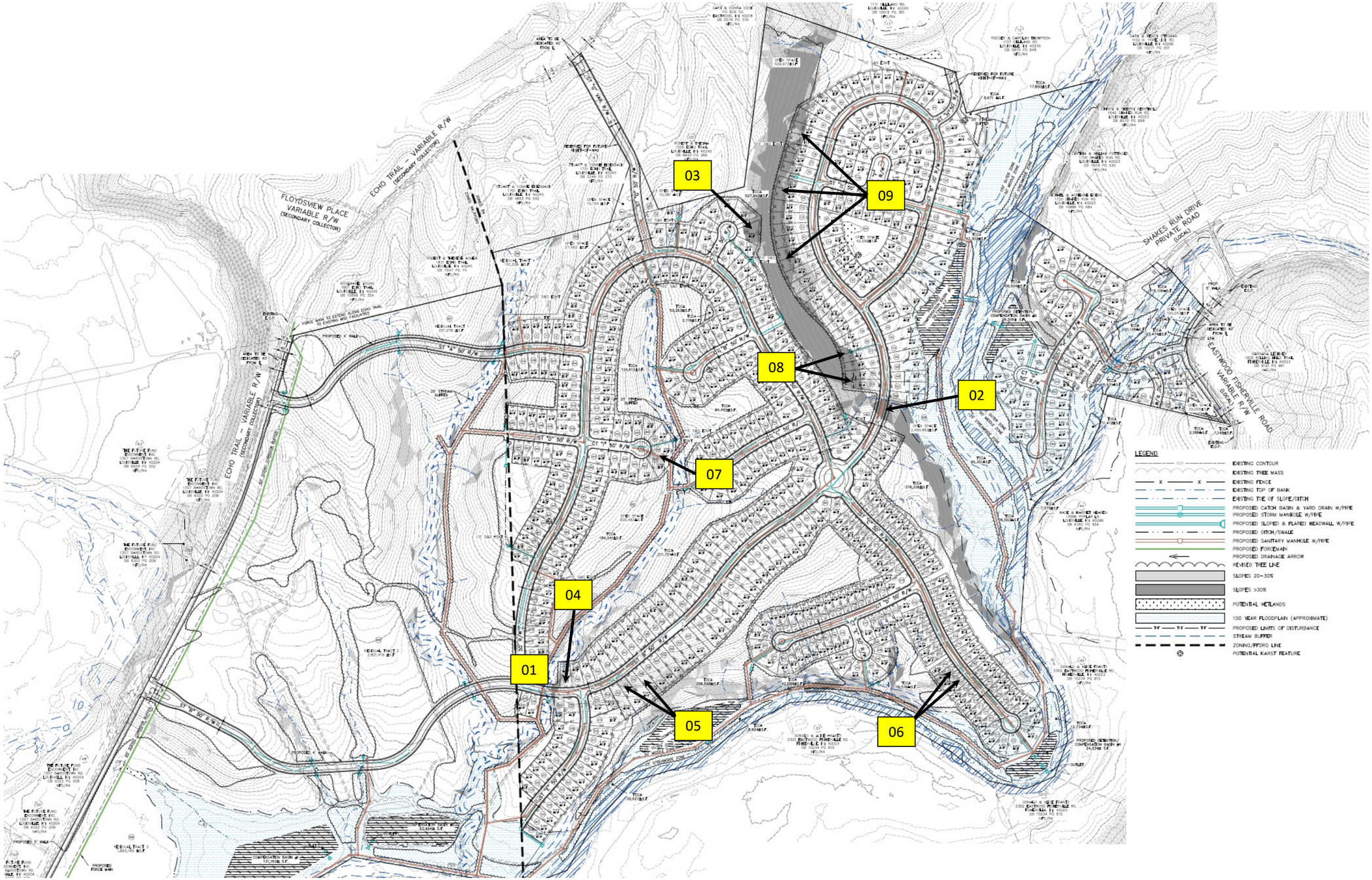

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