6/1/2023

# GEOLOGIC HAZARD STUDY APPLICATION

Applicant: Goodwin Knight, LLC  Telephone: 719-598-5190

Address: 8605 Explorer Drive, Ste 250  Email: dmorrison@goodwhinknight.com

City/State/Zip: Colorado Springs, Colorado

Site Location: 2210 Old Ranch Road, Colorado Springs, CO #6228001007

The following documents have been included and considered as part of this study (checked off by individual(s) preparing the geologic study):

_X_ Rezoning

_X_ Development Plan

____ Land Use

____ Public Improvement construction drawings

____ Final Plat

## ENGINEER'S STATEMENT

I hereby attest that I am qualified to prepare a Geologic Hazard Study in accordance with the provisions of the City of Colorado Springs Unified Development Code Section, 7.4.5 Geological Hazards. I am qualified as:

X_____ Professional Geologist as defined by C.R.S. § 23-41-208: or,

_____ A professional Geotechnical Engineer licensed by the Colorado State Board of Licensure for Architects, Professional Engineers and Professional Land Surveyors.

Kelli Zigler

Submitted by: Kelli Zigler  Date: November 22, 2024

This Geologic Hazard Study Is filed in accordance with the City of Colorado Springs Unified Development Code Section 7.4.5 Geological Hazards.

**City Engineering:** _____ **Date:** _____

Structural
Geotechnical

Materials Testing
Forensic

# GEOLOGIC HAZARD VALIDATION

## Cottages at Kettle Creek
## El Paso County, Colorado

## PREPARED FOR:

**Goodwin Knight LLC**
**8605 Explorer Drive Ste 250**
**Colorado Springs, CO 80920**

## JOB NO. 197353

## November 22, 2024


**Respectfully Submitted,**
**RMG – Rocky Mountain Group**

**Kelli Zigler**
**Project Geologist**

**Reviewed by,**
**RMG – Rocky Mountain Group**

COLORADO REGISTERED
ANTHONY P. MUNGER
11/22/24
39818
PROFESSIONAL ENGINEER

**Tony Munger, P.E.**
**Sr. Geotechnical Project Manager**

## Project Description

The project lies in northwest portion of Section 28, Township 12 South, Range 66 West of the 6th Principal Meridian, in City of Colorado Springs, El Paso County, Colorado. The site is generally located east of the intersection of Old Ranch Road and Kettle Creek Road.

It is our understanding the existing residence, well and septic system are to be demolished and all resulting debris removed prior to new construction. Based on the Concept Plan provided to us by Goodwin Knight dated July 31, 2024, the proposed development is to include 85 structures comprised of studio units, one-bedroom units, and two-bedroom units, for a total of 174 units. Of the proposed 87 structures, 14 are to be 2-story studios, 33 are to be 2-story one bedrooms, and the remaining 40 are to be 2-story two bedrooms. The plan also includes 188 parking spaces, 28 garage spaces, club house, outdoor amenities, and associated parking. One private full-spectrum detention pond is proposed near the southwest corner of the property. All common areas, landscape improvements and open space shall be maintained by the property owner and/or property-management company. The Development Plan is presented in Figure 1.

RMG – Rocky Mountain Group was requested to revise the previous Geologic Hazard Validation letter previously approved April 30, 2024 with #DEP-23-01086 (referenced herein) on file with the City of Colorado Springs for this site. The purpose of the update is to revise this letter to reflect the currently-proposed project layout. Our findings are presented in this report.

## Existing Site Conditions

Currently, the property contains one single-family residence with a detached garage and multiple outbuildings. A well and septic system are located northeast of the single-family residence. The property currently consists of 11.9 acres and is zoned with in the County of El Paso as: RR-2.5, *"Rural Residential"*. It is our understanding the property is to be annexed into the City of Colorado Springs and the zoning is anticipated to be PUD – *"Planned Unit Development"*.

## Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site were available for our review and are listed below:

1. *Geologic Hazard Validation Letter, Hope Chapel Road, Old Ranch Road, Colorado Springs, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 195670, dated February 14, 2024.
2. *Geologic Hazard Study, Currently addressed as: 2210 Old Ranch Road, EPC Schedule No. 6228001007, El Paso County, Colorado Springs, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 182596, amended June 6, 2022.
3. *Preliminary Soils Investigation, Currently addressed as: 2210 Old Ranch Road, EPC Schedule No. 6228001007, El Paso County, Colorado Springs, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 182596, dated July 8, 2021.

The findings, conclusions and recommendations contained in those reports were considered during the preparation of this report.

As part of our review, we also reviewed the following documents:

1. Dames and Moore, 1985, *Colorado Springs Subsidence Investigation, State of Colorado Mined Land Reclamation*.
2. Federal Emergency Management Agency (FEMA), March 17, 1997, *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0506F.*
3. City of Colorado Springs, Colorado, *Map of Areas Susceptible to Differential Heave in Expansive, Steeply Dipping Bedrock,* by John Himmelreich, Jr. and David C. Noe.
4. Hillside Overlay Map, The City of Colorado Springs Map Viewer at: https://gis.coloradosprings.gov/Html5Viewer/?viewer=springsview
5. Colorado Geologic Survey, Colorado Springs Landslide Susceptibility, https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=5e7484a637c4432e84f4f16d0af306d3.

Based upon our review of these documents, the site:

- does **not** lie within a known area of underground mining;
- does **not** lie within the 100-year floodplain of the Kettle Creek;
- is **not** underlain by steeply dipping bedrock;
- does **not** lie in an area that contains ancient landslide debris;
- does **not** lie in a rockfall hazard zone;
- does **not** lie within an area considered potentially susceptible to landslides;
- does **not** lie within the city of Colorado Springs Hillside Overlay Zone, and
- does **not** have a history of known landfill activity.

# GEOLOGIC CONDITIONS

One previous *Geologic Hazard Study* was completed by RMG previously and is referenced above. We reviewed our previous report and considered it the preparation of this validation report.

Our previous *Geologic Hazard Study* identified no geologic conditions that would preclude the development, as currently proposed. We identified the geologic constraints that may affect this site as:

- Expansive soils and bedrock
- History of landfill activity or undocumented/uncontrolled fill activity
- Seismic hazard
- Radon

**Expansive Soils and Bedrock**

Areas of expansive clay soil and claystone bedrock were encountered in the upper soils and in the bedrock within the borings performed by RMG. The expansive materials were sporadic across the overall site.

The referenced *Preliminary Soils Investigation* stated the sandy clay and claystone are considered to have low to moderate swell potential and are not suitable for direct bearing of foundations. If expansive soils or bedrock are encountered near foundation or floor slab bearing levels, overexcavation and replacement with non-expansive structural fill to depths of approximately 3 to 5 feet below foundation components should be anticipated. However, depending on the soil conditions encountered in the site specific subsurface soil investigations, overexcavation to deeper depths may be required. Note, the on-site clay soils and claystone bedrock are not recommended for use as structural fill below foundation components of floor slabs.

**History of Landfill Activity or Undocumented/Uncontrolled Fill**

Fill soils were not encountered in the *Preliminary Soils Investigation* performed by RMG. However, a known septic field and septic tank are located northeast of the existing residence. Additional fill soils may be encountered in the vicinity of the existing structures, berms and paved areas. It is our understanding the structures, septic tank, septic field and all related components are to be removed prior to overlot grading.

We originally stated if the soils associated with the septic field are disturbed during development or construction, they will be considered unsuitable for any reuse on-site (overlot fill, structural fill and exterior backfill) and should be removed and disposed of in an approved off-site location.

If any other man-placed fill is encountered during development and/or construction, it is considered unsuitable for support of foundations. These soils (e.g. berms, exterior backfill from existing structure) should be mixed in at the time of the overlot grading and/or removed (overexcavated) and replaced with compacted structural fill prior to placement of any new fill or structures. The onsite sands generally can be used as structural fill if all organics have been removed. The zone of overexcavation shall extend to the bottom of the unsuitable fill zone and shall extend at least that same distance beyond the building perimeter (or lateral extent of any fill, if encountered first). Additionally, all construction materials and debris resulting from the removal of the septic tank, septic field, existing structures, and any paved areas shall be removed and disposed of in an approved off-site location.

**Seismicity**

Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions

resulting from minor earthquakes are more likely to affect structures at this site will likely only affect slope stability to a minimal degree.

Most of Colorado is generally considered to have the potential for high indoor levels of radon gas, based on the geology, soils, construction type and aerial radiation measurements that have been gathered from indoor testing by the Colorado Department of Public Health and Environment (CDPHE), Radon Outreach Program and Colorado Environmental Public Health Tracking the information provided at https://www.colorado.gov/pacific/cdphe/colorado-radon-zones.

Mitigation

The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.185g for a short period ($S_s$) and 0.059g for a 1-second period ($S_1$). Based on the results of our experience with similar subsurface conditions, we recommend the site be classified as Site Class B, with average shear wave velocities ranging from 2,500 to 5,000 feet per second for the materials in the upper 100 feet.

The following recommended Seismic Design Parameters are based upon Seismic Site Class D, and a 2 percent probability of exceedance in 50 years. The Seismic Design Category is "B".

| Period (sec) | Mapped MCE Spectral Response Acceleration (g) | | Site Coefficients | | Adjusted MCE Spectral Response Acceleration (g) | | Design Spectral Response Acceleration (g) | |
|---|---|---|---|---|---|---|---|---|
| 0.2 | $S_s$ | 0.206 | $F_a$ | 1.6 | $S_{ms}$ | 0.329 | $S_{ds}$ | 0.219 |
| 1.0 | $S_1$ | 0.058 | $F_v$ | 2.4 | $S_{m1}$ | 0.139 | $S_{d1}$ | 0.093 |

Notes: MCE = Maximum Considered Earthquake
g = acceleration due to gravity

**Radon**

Radon is not believed to be an unusual hazard from the naturally occurring source of radioactivity on the property. However, the type of alluvial material found on the property is generally associated with the production of radon gas and concentrations that exceed the accepted EPA standards.

Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after the apartment complex is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, it is recommended that the residence be tested after they are enclosed and commonly utilized techniques are in place to minimize the risk.

In addition, we have included discussions on the potential constraints that may also be present on the site:

- Potentially Compressible Soils
- Potentially Seasonal Shallow Groundwater
- Erosion, Fill Slopes

**Potentially Compressible Soils**

The surficial alluvial soils may exhibit compressible or hydrocompactive characteristics and are sensitive to extreme moister changes. These soils were encountered across the entire site at depths ranging between 3 to 14 feet. The soils are moderately compacted in their native state and are of uniform grain size.

It is our opinion that the risks to the proposed structures at this site posed by compressible and/or hydrocompactive soils are generally low for lowly- to moderately-loaded structures. However, the site-specific subsurface soil investigations performed for each building should consider mitigations for compressible/hydrocompactive soils. We have included general mitigation concepts below that are typical to this region of El Paso County, Colorado.

Mitigation

Some removal and replacement may be required if isolated pockets of loose soils are encountered and/or for some moderately- to heavily-loaded structures, if proposed. Subexcavation is currently not proposed by the contractor, nor does RMG propose mitigation through a "mass" removal and replacement process at this time.

Additionally, the potential for settlement is directly related to saturation of the soils below foundation areas. It is imperative that good surface and subsurface drainage be maintained throughout the life of the structures to reduce the potential for saturation of these soils.

The final determination of mitigation alternatives and foundation design criteria are to be determined in site-specific subsurface soil investigations for each lot. Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of compressible/loose soils is not considered to pose a risk to the proposed structures.

**Potentially Seasonal Shallow Groundwater**

Groundwater was encountered in one of the test borings performed for the referenced study at approximately 14 feet below the ground surface in March 30, 2021. We do understand, groundwater measurements in our test borings are limited to the time of the year measured (winter/early spring) and are generally inaccurate in predicting groundwater or seasonal variations. However, it is our opinion, the groundwater is perched atop the claystone bedrock and is not a true groundwater table.

The claystone was encountered in the test borings at depths ranging between 9 and 16 feet below the surface. All the structures are to have slab-on-grade foundations or crawlspace foundations. The foundation excavations are expected to be approximately 3 to 4 feet deep, which will provide suitable separation from the perched water to the bottom of foundation components and slabs.

The cottage units are considering a crawlspace foundation or a stiffened slab foundation with no below grade livable space. Finished floor elevations were not provided. However, Base Flood Elevation (BFE) for Kettle Creek ranges between 6668 feet near the southern portion of the site up to 6680 near the northern portion of the site. The estimated finished floor elevations of the units are approximately 54 plus feet above the nearby BFE.

The groundwater and surface runoff will likely be impacted by precipitation and proximity to Kettle Creek. In reviewing aerial photos, it appears water flows within Kettle Creek generally range from a trickle to low during rainfall or snowmelt events. We anticipate the potential for periodically high surface moisture conditions within the confines of the Kettle Creek floodplain, but not reaching up to the level of the proposed development. The concerns of an unconfined aquifer below the site may be valid, but based on the available data and the separation from the proposed foundation/slab for the cottage units, it is not considered to pose a risk to the proposed construction.

Mitigation

Main-level slab-on-grade foundations or crawlspaces with living space above are proposed for the cottage unit structures. The club house may also consider stiffened slab-on-grade foundations.

Generally, foundations that are subjected to constant moisture variations are susceptible to frost heave. The foundations for this site's elevation should penetrate to the recommended frost depth of 30 inches to limit the formation of ice lenses beneath foundation components. A subsurface perimeter drain will be necessary for crawlspace foundations to help prevent the instruction of water into areas located below grade. Perimeter drains are not anticipated for slab-on-grade/stiffened slab foundations.

Depending on the conditions observed at the time of the Open Excavation Observation, an underslab drainage layer may also be recommended to help intercept groundwater before it enters the slab area should the groundwater levels rise. In general, if groundwater was encountered within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be anticipated. Careful attention should be paid to grade and discharge of the drain pipe.

It must be understood that the drain is designed to intercept some types of subsurface moisture and not others. Therefore, the drain could operate properly and

not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

**Erosion, Fill Slopes**

It is our understanding drainage improvements integral to the proposed development will include collecting and redirecting all surficial water away from Kettle Creek and directing it to the southwest towards the new proposed full-spectrum extended detention basin.

This site is not included in the Hillside Overlay Zone, but does contain steeper slopes near the eastern portion of the site. The slope in its native state is approximately 30 feet in height. Based on review of the Preliminary Grading Plan, this slope is to be regraded to a 3:1 (horizontal:vertical). A 2-foot berm/swale is proposed near the back (east side) of the structures, atop the regraded slope. Proper control of drainage, both at the surface and in the subsurface is extremely important across the site but is imperative atop the slope to reduce saturation of the slope and unstable conditions.

Mitigation

Erosion control measures and engineered site drainage will be installed during construction to prevent concentrated runoff from exacerbating erosion along the western bank of Kettle Creek. The property owners will be responsible to periodically observe the western banks to identify signs of new or localized erosion. Areas undergoing active erosion should be promptly corrected and restored to ensure the continuing stability of the banks of the creek.

A slope stability analysis was not conducted on the eastern slope. Construction or any cuts should be avoided on or at the toe of the slope unless analyzed for global stability or stabilized.

Based on our review of our previous report and the Development Plan, it is our opinion that the findings and recommendations presented in the *Geologic Hazard Study* are still valid for the currently proposed construction of the proposed development.

# CLOSING

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

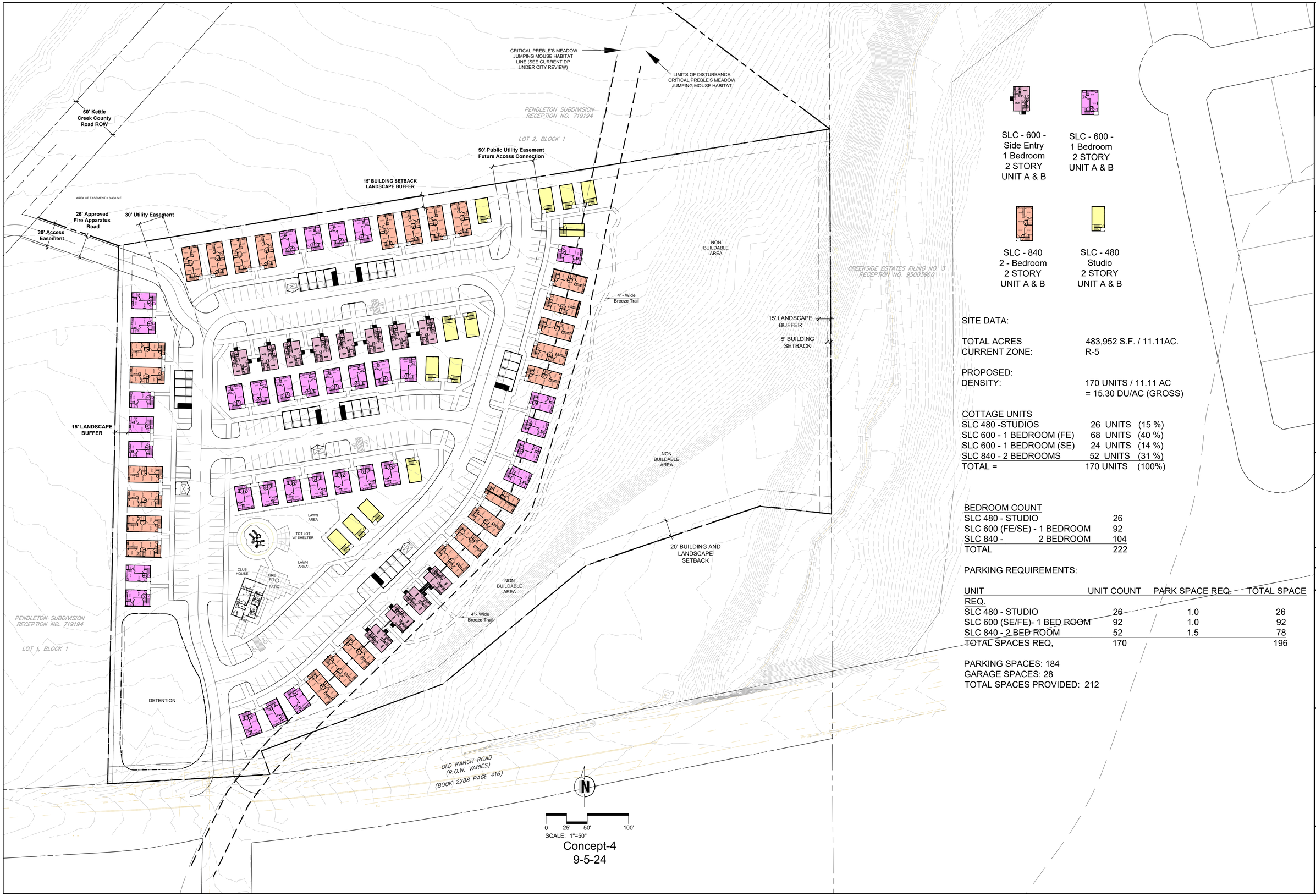
The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or

conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied, is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

# FIGURES




Concept-4
9-5-24

SLC - 600 - Side Entry 1 Bedroom 2 STORY UNIT A & B

SLC - 600 - 1 Bedroom 2 STORY UNIT A & B

SLC - 840 2 - Bedroom 2 STORY UNIT A & B

SLC - 480 Studio 2 STORY UNIT A & B

SITE DATA:

| | |
|---|---|
| TOTAL ACRES | 483,952 S.F. / 11.11AC. |
| CURRENT ZONE: | R-5 |
| PROPOSED: | |
| DENSITY: | 170 UNITS / 11.11 AC = 15.30 DU/AC (GROSS) |

COTTAGE UNITS

| | | |
|---|---|---|
| SLC 480 -STUDIOS | 26 UNITS | (15 %) |
| SLC 600 - 1 BEDROOM (FE) | 68 UNITS | (40 %) |
| SLC 600 - 1 BEDROOM (SE) | 24 UNITS | (14 %) |
| SLC 840 - 2 BEDROOMS | 52 UNITS | (31 %) |
| TOTAL = | 170 UNITS | (100%) |

BEDROOM COUNT

| | |
|---|---|
| SLC 480 - STUDIO | 26 |
| SLC 600 (FE/SE) - 1 BEDROOM | 92 |
| SLC 840 - 2 BEDROOM | 104 |
| TOTAL | 222 |

PARKING REQUIREMENTS:

| UNIT REQ. | UNIT COUNT | PARK SPACE REQ. | TOTAL SPACE |
|---|---|---|---|
| SLC 480 - STUDIO | 26 | 1.0 | 26 |
| SLC 600 (SE/FE)- 1 BED ROOM | 92 | 1.0 | 92 |
| SLC 840 - 2 BED ROOM | 52 | 1.5 | 78 |
| TOTAL SPACES REQ, | 170 | | 196 |

PARKING SPACES: 184
GARAGE SPACES: 28
TOTAL SPACES PROVIDED: 212



GOODWIN KNIGHT, LLC
8605 EXPLORER DRIVE, SUITE 250
COLORADO SPRINGS, CO 80920
719.598.5190

PROJECT NAME
Old Ranch Road
Colorado Springs, CO
GOODWIN KNIGHT LLC

STAMPS/ENDORSEMENTS

DRAWN BY: RN

DATE: 03-22-22

SUBMITTALS / REVISIONS

| DATE | TYPE | BY |
|---|---|---|

SUBMITTALS / REVISIONS

| DATE | TYPE | BY |
|---|---|---|

SHEET NUMBER
1
1 OF 1 SHEETS
CITY FILE NUMBER: