

August 23, 2016
Revised August 24, 2016

Shea Canyons, LLC
1805 Shea Center Drive
Suite 450
Highlands Ranch, Colorado 80129

Attention: Mr. Skyler Hager

Subject: Surface Screening for
Naturally Occurring Radioactive Material (NORM)
The Canyons
Douglas County, Colorado
CTL Project No. DN47,784-235

CTL Thompson completed a field survey of surface readings for naturally occurring radioactive material in The Canyons (Site) as requested by Shea Canyons, LLC (Shea). The Site is generally located near and adjacent to the intersections of Interstate Highway 25 at Hess Road and Happy Canyon Road, in Douglas County, Colorado. This survey and letter evaluates the potential risk at the Site due to gamma-ray naturally occurring radioactive material (NORM).

Introduction

Naturally Occurring Radioactive Material (NORM) is defined by the Environmental Protection Agency (EPA) as “materials which may contain any of the primordial radionuclides or radioactive elements as they occur in nature, such as radium, uranium, thorium, potassium, and their radioactive decay products, that are undisturbed as a result of human activities.” Radiation levels emitted by NORMs are referred to as “background” levels. Geologic factors play a role in the concentration of NORMs at a given location. For example, clays contain higher levels of NORMs than shales or sandstones based on their physical nature.

Our screening was performed in an attempt to determine if there were elevated gamma-ray readings, which could suggest source areas which cause readings above background levels. Our screening does not detect alpha or beta emissions.

Field Survey

CTL coordinated with Shea to electronically map the boundaries of the approximately 550-acre site shown on Figure 1. The electronic file was loaded onto our hand held GPS monitor which displays the property boundaries. We accessed the site on August 12th and 15th, 2016 and traversed the Site boundaries and interior on foot and located 134 sample points shown on Figure 2. Using a Ludlum 19 Micro-R meter we took readings on the ground surface. We believe a representative survey was performed. Generally, the planned development area of the Site was fully represented by our survey. Additionally, background readings from surrounding areas that were not within the Site boundaries were recorded.



The area of this survey has not been overlot graded. Utilities have not been installed. The Site is generally undisturbed native land only used for rangeland activities.

Conclusion

During our field survey we found readings generally within the target emissions level of 15 to 30 uR/hr. Readings are shown on Figure 3. Most of our readings were between 20 and 29 uR/hr. Some higher readings were recorded as we progressed to the northern and eastern regions of the site. The readings were consistently higher in the drainage bottoms or small canyons where there were significant side slopes adjacent to the sample location, thus providing more earthen material and slightly higher readings. Readings in these areas generally fell in the 26 to 32 uR/hr range with two readings at 32 and one readings at 34 uR/hr at the northeast portion of the Site. Background readings recorded outside of the site boundary ranged consistently ranged from 20 to 28 uR/hr.

Based on our review of historical information presented by the U.S. Department of Energy, we conclude that residential or commercial development of the site is an appropriate land use. Our gamma readings taken from the surveyed areas of The Canyons indicated that uR/hr emissions generally fall below the targeted limit of 30 uR/hr and are generally similar to background levels in the area. We do not believe further action is needed with regard to this issue.

Limitations

We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the locality of the project. No other warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report, please call.

CTL | Thompson

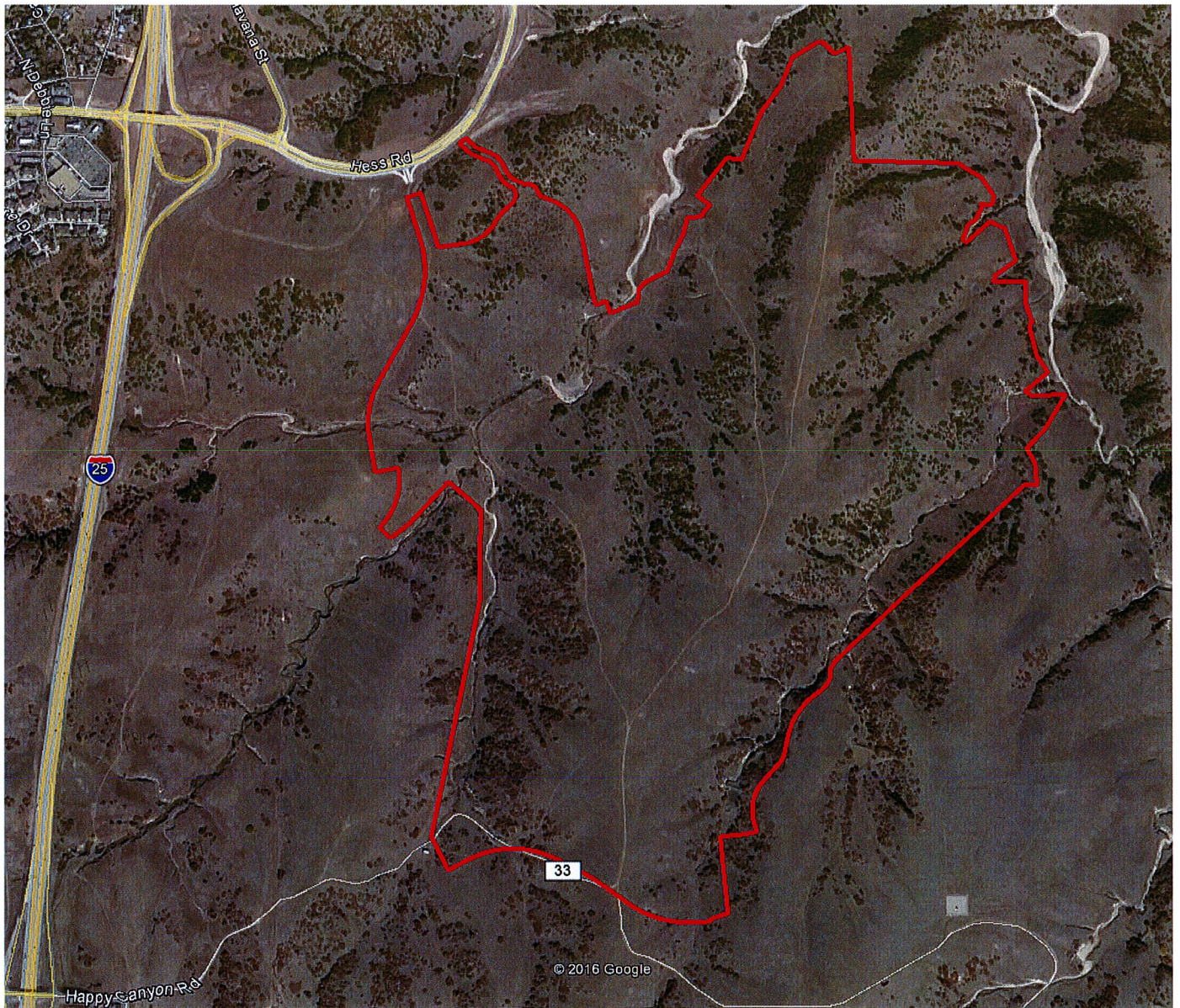
Grant R. Emery
Environmental Scientist

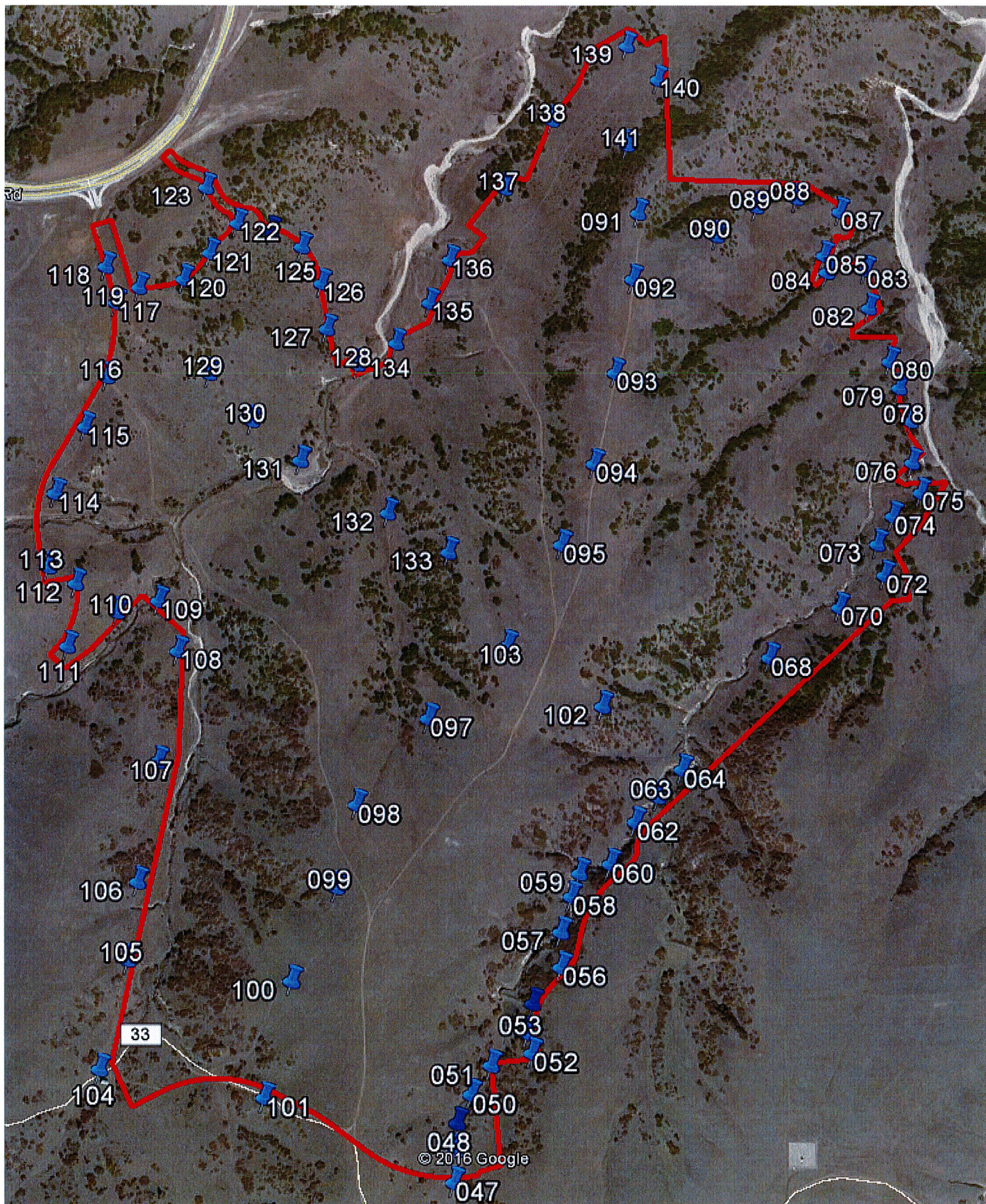
Reviewed by:

Matthew L. Wardlow, P.E.
Environmental Department Manager

GRE:MLW/ot

Via e-mail: skyler.hager@sheahomes.com





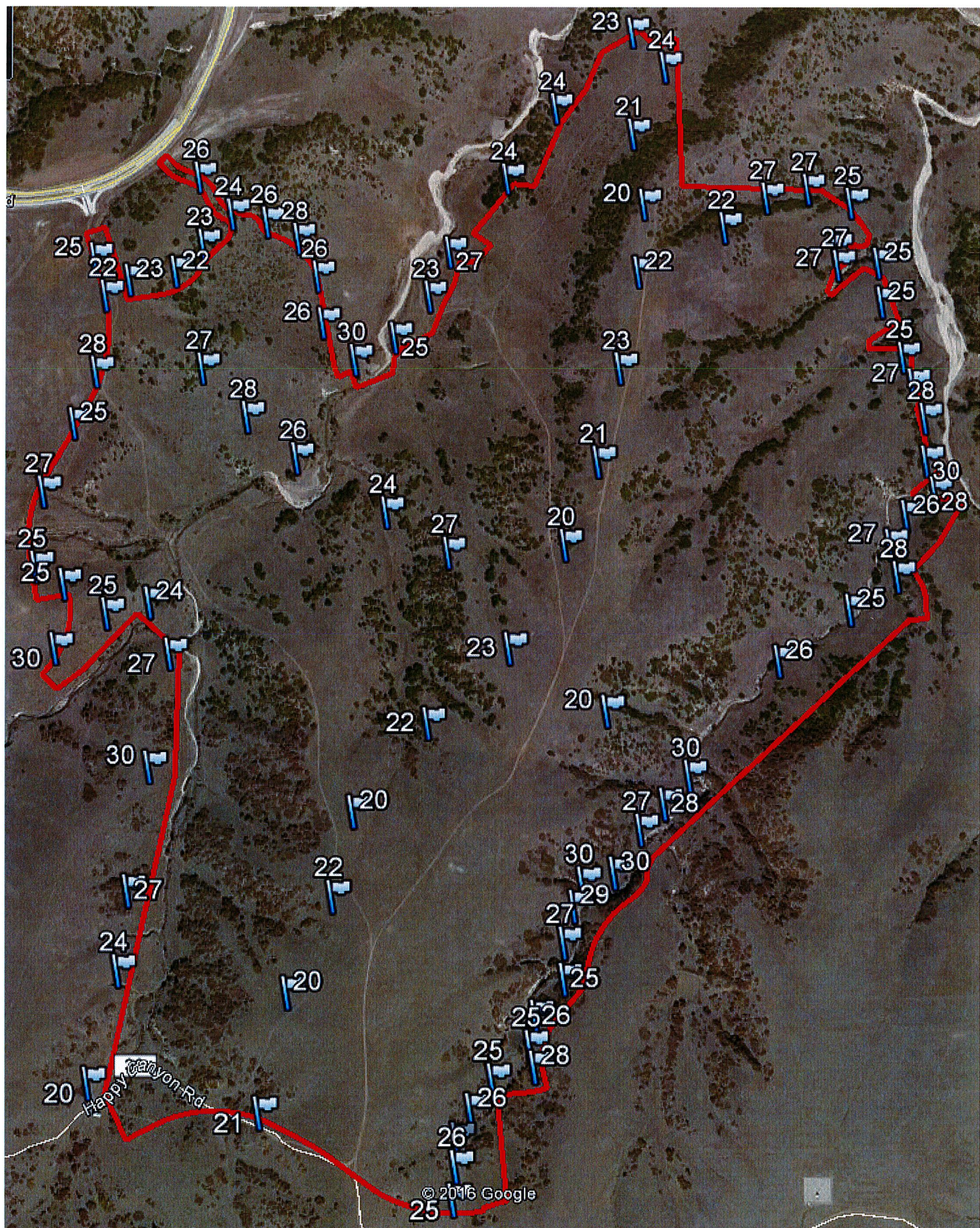


Figure 3
Map of Radiation Readings (Units of $\mu\text{R/hr}$)